UNIVERSITY OF CAPE TOWN

Theorizing ICT-based Social Innovation on Development in the Context of Developing Countries of Africa

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Dedication

To GOD the Almighty, and to my family.

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First is God's unfailing love that has seen me through this journey.

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Abstract

Background - The main concern of this study is that the perspectives at the foundation of the deployment of information and communication technologies (ICT) undermine the pertinent long-term benefits in developing countries. Not only that, but they also affect the ways in which communities in the global information society engage themselves in the diffusion process of ICT.

Claim of the study – The innovation and diffusion process of ICT in developing countries of Africa is foreign and sponsor driven. Consequently, the process is infested with a focus on the realizations in the short-term, with a continued domination of technological innovations by the technologically advanced communities. The argument in this study is that Africa's developing countries need to change their perspectives, and play an active role to drive the diffusion process of ICT in local contexts for long-term developmental impacts.

Purpose of the study – The main aim of this study is to explore the conceptions surrounding ICT processes in theory and practice, for the purpose of gaining insight into the improved approaches for applied ICT. The study looks into ways through which local communities and their governments in Africa's developing countries can play a role in cultivating the enhancement of ICT to promote productivity, like it has happened in other places of the world.

Problem statement – The assumption for the problem statement draws from the expressed main concern in the background. That is, there is a need for adequate theoretical foundations to appropriately guide the ICT deployment and application initiatives for effective social development in Africa's DCs. In the other words, theoretical contributions in the discipline of information systems are needed to explain the relationships between long-term impacts of ICT and societies, and the frameworks for practice to realize the impacts.

Design/methodology/approach - The study takes a qualitative approach, guided by interpretive epistemology, in the paradigm of social constructivism. It uses the perspectives of Sen's *capabilities* and *functionings* to craft a theoretical framework for the deployment of ICT for social development in Africa's DCs. Data for the study were mined from the ITU-WSIS Stocktaking and the IDRS databases. Content analysis techniques were applied in the analysis of data.

Findings – Most of the initiatives to apply ICT are based on problem solving approaches with a focus on realizing impacts in the short-term. The initiatives are foreign driven, and they rely on foreign sponsorship for resources. The local component for the strategic deployment of ICT for long-term productivity outcomes in Africa's DCs is not significantly evident.

Contributions – This study has exposed the weak position of firms in the creation of the necessary *complementary investments*, *innovation complementaries*, and *inter-sectoral linkages* in the diffusion process of ICT in Africa's DCs. This results in a low and narrow appropriation level of ICT, which does not promote *factor productivity* growth and ICT's contribution to output. This situation may not change soon if the developing countries do not commit to taking initiatives to promote local innovation capabilities for the strategic diffusion of ICT. To this I proposed for State intervention.

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Acronyms

ADCs	Africa's Developing Countries
AISI	African Information Society Initiative
CA	Capabilities Approach
CTO	Commonwealth Telecommunications Organization
EASSy	East Africa Submarine System
GDP	Gross Domestic Product
GPT	General Purpose Technologies
ICT4D	ICT for Development
IDIA	International Development Informatics Association
IDRC	International Development Research Centre
IDRIS	IDRC's "MINISIS-based" Project Information System
IDS	Institute of Development Studies
ICT	Information and Communication Technology
ICT-GPT	ICT as a class of General Purpose Technologies
ITU	International Telecommunications Union
MDGs	Millennium Development Goals
NEPAD	New Economic Partnership for Africa
NICI	National Information Communication Infrastructure
OLPC	One Laptop per Child
OT	Organizational Transformation
PMID	Partnership on Measuring ICT for Development
SI	Social Innovation
SIM	Social Innovation Machinery
SIMSD	Social Innovation Mediated Social Development
UAE	United Arab Emirates
UNDESA	United Nations Development of Economic and Social Affairs
UNDP	United Nations Development Program
UNCTAD	United Nations Conference on Trade and Development
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Education and Science Commission
WDR	World Development Report
WSIS	World Summit on the Information Society

CHAPTER ONE: Introduction and Problem Statement

1.0 Introduction

Information and Communication Technologies (ICTs) have fundamentally changed the lives of human beings. New, previously unpredictable, lifestyles are evolving. There have been unprecedented increases in productivity in the places where these technologies have been strategically and successfully deployed (Bagchi & Udo, 2007). Significant economic, social, political and cultural impacts are progressively manifesting as a result of the spread of such technologies (Senne, Barbosa, & Cappi, 2013).

Unfortunately, according to the '*Measuring Information Society Report'* (ITU, 2014), there is a limited uptake of ICTs in developing countries; with Africa - where the majority of the developing countries are located, having just 19% of its population using the internet (ITU, 2014). It has been a long standing concern of the global development stakeholders that, despite the promises of ICTs to offer developmental opportunities, some societies are not able to exploit the technologies for those opportunities. This phenomenon is unanimously conceptualized in the acronym of 'digital divide'. Starting in year of the first World Summit on Information Society (WSIS-2003), considerations for special efforts to address the situation have been quite significant. The 'umbrella' of ICT for Development (ICT4D) (discussed further in Section 1.2) is - one of the ways through which development stakeholders expect to have all societies in the world able to realize the benefits of ICTs for social development ends and a better world (Sahay, 2013). This goal was set at the first WSIS (2003) and is encompassed in the Millennium Development Goals (MDGs) action plan (ITU, 2005).

The core of this study's argument is that developmental transformation is a human-centred, long-term, social aspect of societies. The study's core observation is that using ICTs to influence this type of social transformation in Africa's developing countries (ADCs) has failed due to three factors: First, the prescribed ICT4D packages (that is, the designated solutions and their content) for realizing development are based on a too narrowly defined 'digital divide' factor, which results in the aspects of technology 'acceptance', 'use', and 'access' to some intrinsic values of ICTs concerned with information processing and dissemination, being too dominant (ITU, 2005; WSIS, 2003). The result is that deprivation of economic aspects of ICT production and ICT for factor productivity, as well as the

immersion of applied ICTs and pertinent innovations in the socio-economic processes of ADCs, has developed. Second, foreign-agency-driven initiatives for addressing 'digital divide', lack provisions for transition to contextually rooted innovations to sustain the initiatives, which means that social innovations based on the perspectives of the host communities are not cultivated. Third, a behavioural component has not been included in the ICT4D packages, with the result that the ADCs' 'agency' capacities, and their contextual environment for generating complementary innovations in support of mainstream ICTs, is not happening. These three factors (evidence for which is provided elsewhere in this study) form the basis for the definition of the research problem. Before defining the problem, it is important to point it out that varied social, economic, political, and environmental characteristics in different world communities, impact ICT4D initiatives in different ways.

This situation makes it necessary for the actors in the field of ICT4D to have an extensive understanding on the different ways in which technological aspects can be effectively operationalized within different societies' specific contexts (Bankole, Osei-Bryson, & Brown, 2011). Evidence from the literature suggests that the focus of ICT-centred research has, so far, been more exhaustive in studying the conditions for receivership of ICTs (defined in 1.1.3), in the acronym of 'technology acceptance' ranging from economic factors (Hall, Bockett, Taylor, Sivamohan, & Clark, 2001; Lundvall, 2007), to social characteristics (Boehmke & Witmer, 2004), to environmental characteristics (Carbonara, 2005; Narula & Santangelo, 2009), and a mix of several other characteristics (Chinn & Fairlie, 2010; Grazzi & Vergara, 2010; Migiro, 2006; Mutula & Van Brakel, 2007). Arguments that local capacity for innovation is fundamental for the well-being of societies and for wealth-creation in DCs have been much less extensive (Ainamo & Docent, 2007).

To contribute to the conceptualizations in ICT4D for increased developmental impacts of ICTs in ADCs, the task that is undertaken in this study is to explore the necessary conditions that could lead to the development of complementary innovations, which would be useful in immersing ICTs in the socio-economic settings and structures of ADCs. The diffusion processes of ICTs; the location of innovations; and the role of 'agency' (specifically the agency of the state) in the diffusion processes of ICTs in the technologically deprived communities of developing countries of Africa, are in particular focus in this study. As part of this exploration, the study theorises social innovation on development in the ADCs. In the process, the concepts of technology diffusion; social innovation; and artefacts, are reconceptualised in this study, in the context of Africa's developing countries, for the

ultimate purpose of developing a better *operational* understanding of the conditions required for enhancing locally-situated social innovation processes, primarily for countries in Africa that currently fall into the traditional ICT-receiver block.

The rest of this chapter proceeds as follows: Section 1.1 provides working definitions of the study's key operationalized concepts and the perspectives in which they are applied in the study. Section 1.2 situates the niche of this study firmly within the perspectives of ICT4D, and it is followed by Section 1.3 which presents the statement of the research problem. Section 1.4 underlines the research objective. The research question and sub-questions, and the approach to the study are presented in Sections 1.5 and 1.6 respectively. Section 1.7 asserts the importance of the study in the discipline of Information Systems. The chapter ends with an overview of the layout of the rest of the thesis (Section 1.8), and a summary of the chapter (Section 1.9).

1.1 Working definitions

For the purposes of clarity, working definitions of the study's key or most used terms, namely ICTs, ICT-GPT, technology diffusion, ICT receivership, digital divide, ICT4D, innovation, artefacts, Social Innovation and Social Innovation Machinery, are outlined upfront in this section. These terms are further developed in the literature review in Chapter 2, but are provided here for purposes of introducing the key focus areas of this study.

1.1.1 Information and Communication Technologies (ICTs)

Hamelink (1994) defined ICTs as "technology" that enables "the handling of information" and facilitates "different forms of communication among human actors, between human and electronic systems, and among electronic systems" (p.3). Pigato (2001) extended this definition to include "both the information infrastructure (wires, transmitters, computers), and the information technology i.e. the applications and content that travel through these infrastructure" (p.1). As a result of current developments in the field of digital technology, the term ICTs has since been stretched to cover a wide range of electronic-based information and communication techniques (Bollou & Ngwenyama, 2008).

As a result, the term 'ICTs', is now widely used in the literature to refer to the wide variety of technological innovations, that exist for the facilitation of information processing, packaging and dissemination. Lyytinen and King (2006) define the concept of ICT as: "technologies dedicated to information processing; involving the use of digital computers and software to convert, store, protect, process, transmit, and retrieve information" (p.405). Ewusi-Mensah

(2012) defines ICT in terms of the 'forms' it can take on, such as e-commerce, e-government, e-learning, and e-health (p.247). This is the same approach used by Gigler (2004) whose conception captures even elaborate electronic items such as community-radio, TV, Internet, e-mail and mobile technologies.

Given this study's focus on the innovation perspective, it is considered preferable to retain the broad definition of ICTs as being inclusive of: hard technology (which refers to infrastructural equipment for the handling and transmission of content); soft technology (referring to applications, electronic platforms, and the necessary types of 'human interactions' whenever needed); and content. This expansive definition is proposed because innovation aspects can emerge from any dimension of technology. Content innovation can be considered as important as technical innovation (Ngozi, 2005), for example. If there is no content to access, investment in connectivity such as the SEACOM, undersea fibre optic cable (Omolola, Bisimwa, van Vuuren, Onumajuru, & Chigona, 2010) may not be of significant meaning in ICT4D.

Note that the terms 'ICTs' and 'technology' are used interchangeably in this study, following the tradition found in other ICT-centred works, such as Bollou and Ngwenyama (2008), Avgerou (2008) and Orlikowski (2008).

1.1.2 ICT-GPTs

ICTs can be further conceptualized as technologies whose impacts are not confined to any economic or social sector, and thus can be realized in many forms and settings. In such cases, they are referred to as 'general purpose technologies' (GPTs) (Bresnahan & Trajtenberg, 1995; Cette, Mairesse & Kocoglu, 2005; Hamel, 2010; Helpman & Trajtenberg, 1996; Jalava & Pohjola, 2007; Jovanovic & Rousseau, 2005; Rohman, 2012). For the purposes of this thesis, wherever the term ICT is used in the notion of GPTs, the extension 'GPT' is added to yield the shortcut 'ICT-GPT'.

1.1.3. Technology diffusion

The term 'diffusion of technology' is related to the uptake and "successful utilization of technology in the work place" (Attewell, 1992, p.1), or an observed "transition from an early pattern in which (a) new technology is typically obtained as a service, to a latter pattern of in-house provision of the technology" (Attewell, 1992, p.1). According to Rogers (2003, p.5), diffusion of technology is "the process in which an innovation (*or a new technique)* is

communicated through certain channels over time among members of a social system". Geroski (2000) and Chigona and Liker (2008) equate technology '*diffusion'* to technology '*adoption'*. Cooper and Zmud (1990) have applied the concept of technology diffusion to ICTs' related implementations in the context that regards such implementations as "diffusing appropriate technology within a user community" (p.124).

Another conception of technological diffusion avails from Nelson and Phelps (1966). According to them, technology diffusion is a process of increasing the level of technology in practices. It is about the creation of a new technique and its adoption, where in relation to production, the technique will be part of output that is 'producible', with other factors of production, specifically labour, "working with it" (Nelson & Phelps, 1966, p.71).

For the purpose of this study, the latter conception of technology diffusion is preferred. In other words, the diffusion of ICT-GPT is understood to be a process characterised by the increase in the stock of knowledge taking place over time, innovatively leading ICTs into becoming part of output that is transitioning from "a pattern in which the new technology is typically obtained as a service, to a pattern of being in-house" (Attewell, 1992, p.1) (or at least as produced in its parts). In addition, in the process of diffusion, the ICTs become working partners of other factors of production such as labour and other capital inputs to production in addition to being "producible" (Nelson & Phelps, 1966, p.71).

1.1.4 ICT receivership

The contemporary scenario as to the command of technology in the world, is that two distinct technology blocks can be identified. One block includes the technologically advanced economies, which own the technological *'know-how'*. This is the block that dominates the development of ICT innovations. This is referred to as the 'block of *origination*', or the '*developer/supply*' block, in this study. The counterpart is the 'technologically *deprived*' block, in which technological *'know-how'* and technology penetration in economic and social spheres of society, are low.

The term, '*diffusion of technology'*, as used in this study, refers to how deeply technology can penetrate the technologically deprived block.

The term, 'ICT *receivership*' is used in this study to refer to the context of societies and their socio-economic conditions, in relation to the up-take of technologies.

1.1.5 Digital divide

The definition of 'digital divide' is an evolving concept and there have been a number of definitions. OECD (2001) defined 'digital divide' as referring to "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities" (OECD, 2001). ITU (2007) asserted that it is not a single divide, but multiple divides that reflect a disparity in wealth. The digital divide is widely seen as a 'discrepancy' gap between more and less developed communities. Tongia and Subrahamanian (2006), understand 'digital divide' in the context of the under-served people who lack physical access to connectivity, and social and political avenues for ICT participation. Steyn (2011) subdivides 'digital divide' into categories of: (1) operational divide, (2) cultural divide, and (3) political divide. The first is said to be about the availability of ICT and access to ICT systems; the second is about some groups lacking either technological or social access to dominant social networks; and the third is about exclusion of some groups or individuals. Steyn (2011) asserts that ICT4D is capable of overcoming the first type of divide "operationally" by addressing infrastructure for ICT and devices for access. For the other two, Steyn posits that ICT4D can empower individuals to close these divides. I must confess at an early stage that I acknowledge the theoretical coinage of the categories of digital divide according to Steyn (2011). However, I suggest that pragmatically ICT4D is still lopsided. (I will address why later.)

In Chapter Two an argument is made that the term 'digital divide' should be stretched to include an '*innovation divide'* as well. (Note that, purely for readability purposes, the thesis refers to '*the* digital divide' and not just 'digital divide'.)

1.1.6. Information and Communications Technology for Development

There are many different perspectives of the term ICT4D (Information and Communications Technology for Development). Some sources refer to ICT4D as the use of ICTs to solve developmental problems, or as the opportunities that exist for ICTs as an agent of development (Sutinen & Tedre, 2010). Tongia and Subrahamanian (2006) describe ICT4D as a dynamic process with goals that shift over time, and see ICT4D as "inherently dependent on the goals of the stakeholders and their ability to participate in defining the right development problems to be solved" (p.202). Steyn (2011) views ICT4D as being about "overcoming [the] digital divide operationally" (p.20) so as to enable the deprived

communities to appropriate ICTs and access ICT systems. Tongia and Subrahamanian (2006), see ICT4D as solving the problem of development through innovations in computers, connectivity, content and human capacity. For the purpose of this study, ICT4D is defined as encompassing the perspectives of enhancing economic opportunities (Heeks, 2010b; Sutinen & Tedre, 2010); empowering communities (Steyn, 2011); operational impacts (Steyn 2011; Tongia & Subrahamanian, 2006); and enabling choice and capabilities (Klein, 2009). This is in line with the dynamic characteristic of ICT4D noted by Tongia and Subrahamanian (2006).

1.1.7 Innovation

Edquist and Hommen (1999) describe innovation as a 'learning process' by which "new knowledge is produced or existing elements of knowledge are combined in new ways" (p.65). According to Gault (2010), innovation is the 'creation of value from knowledge'. A different view of innovation is proposed by Meyer (2000), who expresses the concept as "the adoption of an internally generated or purchased device, system, policy, program, process, product or service, that is new to the adopting organization" (p.329). This definition directly corresponds with Rogers' (2003) definition, namely that "an innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption". The latter is a view of innovation as 'an-object' while the former is a view of innovation as a mental process. Mulgan (2006) defines an innovation as the outcome of deliberate efforts towards developing and shaping an idea, a product, a process, or a method; and refers to innovations as "tools".

This study views innovation as the generation and adoption of new concepts; as such it involves creativity, learning, and the objects of creation and learning. It also takes the view that in societies there can be organized systems for innovation, through which efforts are directed towards desired outcomes.

1.1.8 Artefacts

Artefacts are innovations developed for certain purposes. They are emergent of human processes that target specific intentions (Sewchurran, 2008). In the process of technology diffusion, "subsequent developments of the original artefact often generate a sequence of artefacts which diffuse over time" (Geroski, 2000, p.604). Artefacts of social performance - whose impacts are in social values such as education, health delivery, social networking etc., are termed as social innovations in the context of ICT4D (Avgerrou, 2008; Phills, Deiglmeier & Miller, 2008). It is within this understanding that applied ICT has specified artefacts for

certain social ends, and centred its conception of technology diffusion and implementations on artefacts as its end results.

A definition of the term 'artefacts' is necessary as its use is modified in this study for the purpose of achieving the developed notion of social innovation (SI) that follows in 1.1.8. When looking at the process of ICT innovation in organizations, Avgerou (2003) draws attention to "the nature of interrelationship between the change of organizational practices (organization as an entity - *injection mine*) and the acquisition or construction of technological artefacts" (p.2). In this sense, I extend the implication to social settings to consider the interrelationship between 'social transformation' and artefacts in the process of technological diffusion. According to Avgerou (2003), the processes involving the generation of artefacts are "not determined by the material properties of the artefact, or by the structural properties of the social context implicated.... in the construction or configuration of ... artefacts" (p.2). This implies that the properties of artefacts cannot be effectively relied upon as solvers of social needs. Artefacts have to be conceptualised in larger settings, necessitating a notion of social innovation that defines their essence when "the people make sense of the(ir) potential(s)" (Avgerou, 2003, p.2) in their social contexts. I hope in motivating this perspective that a better understanding of the nature of the linkages between social innovation, artefacts, and socio-economic development in the realm of applied ICTs will emerge. Such an improved understanding should enable the community of practice in ICT4D to get a better hold on the patterns of technology diffusion processes. In this thesis, I am developing a perspective that artefacts do not equate to social innovation after I have reconceptualized social innovation as a social capability. I thus proceed to say that artefacts developed to meet social needs should be regarded as just instances, or functionings generated in a broad activity of a society, as a society draws on its social innovativeness capabilities in the context of ICT4D.

1.1.9 Social Innovation

Innovation processes in social contexts in general have been referred to in literature as social innovations. When rigour is applied to analyse the perceptions in which the term has been used, two distinctive reference frames are obtained. One is where 'social innovations' is used in the perspective of 'innovative objects' or *artefacts* addressing social needs. Examples of this include: Phills, Deiglmeir and Miller (2008) who refer to social innovation as "any novel and useful solution to a social need or problem, which is better than existing approaches (i.e.

more effective, efficient, sustainable or just) and for which the value created or the benefits obtained primarily accrue to a society as a whole, rather than private individuals" (p.11); Mulgan (2006) expresses 'social innovations' as "...innovative activities and services that are motivated by the goal of meeting a social need..." (p.146); and Gardner, Acharya and Yach (2008) conceive of the term as promoting socially focused innovations. In all of the above cited literature, the origination of the innovations is not in question.

The second set of perspectives includes Marcy and Mumford (2007), who view 'social innovation' as a 'social phenomenon', when they state: "social innovation is the generation and implementation of new ideas about people and their interactions within social systems". Similar conceptions are expressed by Mulgan (2006) and Sewchurran (2010), who perceive 'social innovation' as phenomena necessarily happening through people. Likewise, Basu and Fernald (2007) describe 'social innovation' as a social process by which a society acquires new forms of life socially, politically, or economically. Such new forms are a result of technological added values taking place gradually or revolutionarily.

In the lenses of the given definitions and additional perspectives, social innovation has a notion of being something that addresses the needs of many, and something addressing people in their collectivity. It is also implied that social innovation is dependent on collective efforts for collective gains, and in some cases is also socially emergent. Social innovation is also viewed as a social-centred process, or a context in which things happen. With this kind of difference in conceptualizing the construct, this study has preferred to view social innovation as a collective term, which organizes social innovation as a state in a social context and not objects.

In this study then, the term 'social innovation' (SI) is used to refer to the capability state of a society, through which new ideas and practices; new social, political or economic processes; new products, services and systems; new policies and so on, get developed and implemented. Apart from addressing social needs, these solution seeking mechanisms need be initiated and powered from within communities, as a source for deliberately desired societal changes or transformation. The notion of SI is derived in response to the views that "*innovation in ... information and communication technologies, should be 'self-cultivated' rather than imported" to cater for the "behavioural notion of development" (Corea, 2000, p.1). In a similar vein, Avgerou (2008) has proposed "socially embedded innovation" (p.21)* that is

centred on locally situated action. These two scholars' views reflect an acknowledgement of Orlikowski (2008) and Reijswouds' (2009) observations that in real senses, technologies are intertwined with social structures and behavioural features that get built into them by their designers, through their development stages. The structures are thereafter imposed on the users who are expected to appropriate them in the instances of the use of technology. However, the behaviours and structures built in technology make the 'right' sense to the local users only if they align with the value attributes that result from the interpretations whose base is the local social context.

In the ordinary senses deriving from the previously sited definitions of SI, social innovations continue to function as carriers of foreign behaviour and structures that do not make sense locally. It is in my assertion therefore that the capability-state-of-society-notion of SI could work to avoid the prolongation of the impositions attached to technological innovations as they get contemplated for addressing problems in African developing countries.

Whenever the abbreviation 'SI' is not used in place of 'social innovation(s)' in the text, the implied conceptualization will be that of the originating cited reference. Otherwise it can be assumed that this - proposed meaning is intended wherever further reference is not provided.

1.1.10 Social Innovation Machinery

To execute social transformation missions, this study comes up with a proposal for what it calls 'social innovation machineries' in developing countries. This concept is first introduced at the end of Chapter 2 and then discussed further in Chapter 3. The term, 'social innovation machinery' (SIM) is used to refer to social arrangements organized by the 'agency of the state' as the people's representatives (Burnet, 1967), in order to foster a supportive context for innovations and innovators in the nation. As such, the state works to inculcate competencies and confidence among its prospective innovating units to drive innovations forward.

The state drives innovations forward by, for example, articulating policies and regulatory frameworks for resource support to ICT innovators, be they individuals or firms. Thus, the state acts to modify the conditions via policies and other directives, and let the individual units, such as people, firms, institutions, or other formal public research establishments, act with freedom to generate or implement new innovative concepts. The state will have to make provision for clauses to sponsor and support such new concepts at various stages of their development and deployment, or diffusion processes. These hypothesized arrangements are

in line with Geneva's plan of action for a global information society, as per the agreements of the World Summit on Information Society 2003 (ITU, 2005). Among them is the action component (No. 6) (Appendix F), which asks for the setting-up of 'enabling environments' for ICT via policies and appropriate frameworks.

SIM can therefore be conceptualized as a social arrangement, founded on the SI platform. It operates at the operational level of Geneva's action plan for an information society, and is designed to be informed by the capabilities approach theory, as will be elaborated in Chapter Three of this study.

These working definitions will be revisited again in Chapter Two and Chater Three -, where they will be developed further, with more reference to the literature. 1.2 An overview of the historical operational perspectives of ICT4D

Digital innovations at the base of ICTs are in the 7th decade (1950-2020), and it is more than sixty years since the debate involving ICTs and their impacts on human lives began to emerge. The elapsing period has seen the emergence of the Internet, mobile phones, globalization, disparities in technology assimilation (digital divide), and the most recent millennium development goals (MDGs). Each one of these has driven the pertinent research and discussion in the debate on ICT4D in one direction or another.

Most particularly, perspectives on the use of ICTs to realize MDGs such as lack of development or under-development, have been most focused on the deprivation of opportunities to *access* and *use* ICTs. Accordingly, the focus of debates have, for a considerable period, hovered on the '*adoption*' of ICTs and on promoting access to, and use of, ICTs for socio-economic ends such as poverty alleviation, improvement of health and education, and gender emancipation, to mention a few. This has led to substantial resources being directed to ICT investments (Steyn & Kirlidog, 2013) aimed at establishing ICT access points for technologically deprived communities.

Contrary to expectations, ICT investments have not yielded significant returns in the same manner as witnessed in developed countries. There are observations that the production, adoption and spread of technical innovations, human capital, and knowledge accumulation, are among the prominent factor gains that have been associated with ICT-led economic growth in developed countries (Arora & Gambardella, 2006; Cette et al, 2005; Jalava & Pohjola, 2007; Rohman, 2013). That said, not all economies in the world have been able to participate beneficially in the exploitation of ICTs for those factor gains.

There is a persistently held view, raised at many international panel discussions, that no society in the world can meaningfully participate in the global economy without the use of technology (ITU, 2005; Rohman, 2012, 2013). As a result, governments have resolved to increase efforts in ICT activity, spurred on by the ideal of a global information society in which all communities of the world might be capable of appropriating the socio-economic potentials of ICT (ITU, 2005, 2010, 2012; ITU & UNCTAD, 2007). UNESCO, UN, OECD, and the World Bank, are said to be at the forefront in advocating the creation of enabling environments for the use of technology, in order to promote development (Senne et al., 2013). Since the first WSIS in 2003, considerable initiatives have taken place to address lack of participation in digital processes around the globe, and Africa in particular (Benner, 2003; ITU, 2012; ITU & UNCTAD, 2007; Ng'ambi, 2006; Steyn & Kirlidog, 2013).

With a reference to MDGs, ICTs in general are among the technologies that are expected to lead to reduced infant mortality rates, reduced maternal deaths, reduced illiteracy levels, etc; while simultaneously increasing per capital income and life expectancy in Africa's DCs (World Bank, 2013). According to Ngwenyama, Bollou, Andoh-Baidoo, and Morawczynski (2006), some studies have found a positive correlation between investment in ICT and economic growth in developed nations (Indjikian & Siegel, 2005), but no such substantial evidence has been found for developing nations. The scholars assume that "perhaps ICT begins to deliver GDP per capita growth only after a certain threshold of ICT has been reached" (Indjikian & Siegel, 2005, p.3), and this level has not yet been attained by Africa's DCs. Ngwenyama et al. (2006) also observe that there are possibly threshold levels of ICT investments, (among other variables, such as health and education), that are required before social development may be realized.

Scholars of technology have raised a concern that perhaps ICT initiatives in ADCs have been *addressing the wrong questions* of societies and development. Gomez and Pather (2010) have proposed some dimensions through which users of technology can, directly or indirectly, benefit from ICT interventions. Their suggestions are centred on adopting ICT initiatives that have potential to influence intangible benefits such as empowerment, self-esteem and social cohesion rather than physical economic returns. Other theoretical contributions suggest the target should be to exploit ICTs for their *productive* and *transformative* capabilities (Ospina & Heeks, 2011), possibly as an alternative to concentrating attention on end-results alone such as poverty eradication.

In essence, the contributions, such as the cited above, are suggesting a broad matrix of perspectives in which the impacts pertinent to ICTs should be located. This should be beyond the capturing of the instances of ICT impacts, inherent in the 'technology use' centred worldview (Dwivedi, Lal, Mustafee, & Williams, 2009), as utilized in some works, such as Grazzi and Vergara (2010), Bankole, Osei-Bryson and Brown (2013), and others. It is my declared worldview that concentrating on technology-use as the sole vehicle for technological benefits appropriation, is limited and enquiries should be conducted into other possibilities for fostering technology up-take. Accordingly, I propose extending assessments or explorations to include possibilities for developing *capabilities* for *locally-driven innovations* capable of responding to socio-economic ills promptly and effectively, from within local communities. I also propose a change of focus from regarding Africa's DCs as solely being potential for the 'use' of technologies, to advocating ADCs' participation in the innovative processes for shaping ICTs and their forms for application in their contexts of relevance. (This stance is later called upon to argue a basis for cultivating SI platforms in ADCs.)

Having expressed the concern that a prolonged deprivation of ICT opportunities in ADCs, catalyzed by technological exclusion of the ADC communities from participating in innovative processes, has resulted from well-intended ICT4D initiatives, I turn my focus to situating the study in the following section.

1.2 Situating the study

This study is situated within the domain of ICT for development (ICT4D). ICT4D is the generic term for, or the carrying flag of, ICT practices used to conceptualize ICT-based interventions in areas of need. Literature on the impact of ICT4D highlights the potential of technology to improve human livelihood (Bankole et al., 2011; Nussbaum, 2001), and to bring about economic development (Baliamoune-Lutz, 2003). The literature indicates that the mechanisms through which ICTs act to improve human livelihoods include improved productivity (Bollou & Ngwenyama, 2008; Dewan & Kraemer, 2000; Jalava & Pohjola, 2007); improved quality of products and services (Corea, 2000); improved quality of health and education (Ngwenyama et al., 2006); automation of processes in production (Zuboff, 1988); and efficacy in trade (Kamau, Guthiga, & Kavulya, 2010), among others.

In the on-going ICT-based efforts across the globe to achieve a global information society, and MDGs in particular, the communities of development partners and technology practitioners have two open needs at hand. One is to have approximately certain *approaches*

for the socio-technical implementations to effect the realization of the MDGs. Here, the communities of thinkers and researchers in different disciplines, are thought to have a role to play in developing hypothetically- or empirically-based theoretical tools, that are *good enough* to guide the efforts to maximize ICTs' impacts in the developing world. These tools include theories on technology acceptance, diffusion of technology, and socially embedded innovation. In brief terms, within the sphere of ICT4D studies, the major approaches for the activation of ICTs in the technologically deprived communities in Africa, have been conceptualized within the approach of technology transfer complemented by technology acceptance. Studies on the factors that stimulate or hinder ICT acceptance / adoption / diffusion across countries in Africa have revealed many contextual variations which call for specific considerations in further ICT-based operations (Grazzi & Vergara, 2010; Mutula & Van Brakel, 2007; Pieter Verdegem & De Marez, 2011). The other concern of the development and technology communities, is to have the appropriate *mechanisms* through which to continuously measure the progress being made in realizing the components of MDGs, such as poverty eradication, bridging the information divide, promoting gender equality, and improved food security and health care among world societies (Gigler, 2004; Senne et al., 2013).

The scope of this study is limited to the contribution to the first need of developing theoretical, or practical tools for the effective implementations of ICTs. It therefore follows that it is vital to understand, as a stepping stone, the ways in which practices in ICT4D relate ICT to development. This is done in the next Section.

1.2.1. Perspectives on how ICT is related to development

The international ICT community understands (1) access to information, (1) knowledge creation and sharing, and (3) ICT investment, to be the powers through which ICTs strengthen economic, social, and cultural development (Johanson, 2011). Based on these perspectives, the focus of initiatives in ICT4D is to strengthen, or remove, the obstacles to these aspects. Each of these will now be elaborated on.

1.2.1.1 Relating ICT to development through access to information

The universal access and ubiquity perspective assumes that developing countries can benefit from ICTs if they are afforded universal access to information ubiquitously and equitably (ITU, 2005). This claim assumes that technology deprived communities are denied the opportunity to consume information for development that is available on the worldwide

network of information. The constraining factors are diagnosed to be lack of physical access and unaffordable cost of access (Sein & Harindranath, 2004). Despite the eruptive spread of mobile technology, this technology is expensive relative to fixed ICT infrastructure (James & Versteeg, 2007) and the cost of mobile broadband is still significant in poor communities (ITU, 2014). Other claims highlight limited technology and skills (Avgerou, 2008), and others distinguish contextual characteristics between the places of technology origination and the places of receivership (Steyn & Kirlidog, 2013). Out of this perspective arises the agenda of WSIS to seek ICT frameworks which can reduce broadband (fixed and mobile) costs.

1.2.1.2 Relating ICT to development through knowledge creation and sharing

The knowledge sharing perspective of ICT for development, assumes that the power of technology in development comes about through its facilitation of knowledge sharing, in other words, knowledge is equated to development (World Bank, 1998). The World Bank Report (World Bank, 1998), for example, stipulates that if knowledge is created as an international public good, it can contribute to development; and furthermore, technology may play a vital role in the facilitation of the sharing of knowledge for development in developing countries. Thus, within this perspective, it is argued that the ICT-based initiatives should focus on enhancing knowledge creation and dissemination among developing countries. This perspective leads to initiatives to establish websites and social networks in developing countries, for example.

1.2.1.3 Relating ICT to development through ICT investments

Another perspective on ICT deprivation holds that the deprived communities fail to capture the necessary stages of development that the benefited countries went through. Baliamoune-Lutz (2003) observes that technology has offered a 'new channel' for economic growth, which may allow developing countries to catch 'the development train' faster; and refers to evidence from studies which indicate that information technology investment has greatly contributed to economic growth in developed countries (Baliamoune-Lutz, 2003, p.151; Kenny, 2000; Sichel, 1997). This pro-investment view leads to the conception and implementation of ICT4D initiatives in the deprived countries, that specifically aim to address MDGs. Generally speaking, the failures of ICTs are, as a norm, also defined within the MDG perspective.

The section ahead offers a brief examination of literature-diagnosed reasons for these ICT4D failures.

1.2.2 Perspectives in the literature on why ICTs have failed to drive development in developing countries

The literature pins the failure of ICTs to satisfactorily drive development in DCs to the values inherent in the development and implementation of ICT4D innovations. These are ascribed to (1) methodological factors; (2) perceptions on the 'development' process; and (3) the basic assumptions at the foundation of the functionality of ICTs in different contexts. Each of these reasons for the failure of ICTs to drive development in DCs, are now explained in more detail.

1.2.2.1 Methodological factors

With regards to the methodology applied in the design, development, and implementation of ICT solutions, the literature points to the non-neutrality of ICT4D innovations, and the tendencies of those innovations to bear the values and identity of their respective innovators (Flores, 1998; Winograd & Flores, 1987). Consequently, the implementation processes of the respective innovations tend to be driven by the identity and values of their originators. These values are influenced by their originators social worldviews, which subsequently get unquestioningly superimposed onto foreign contexts, that then do not respond to the originators' innovations as expected. When such technologies are deployed in the developing countries, they may therefore not necessarily achieve 'developmental practices', as desired (Hayes & Westrup, 2013). Methodologically, developing solutions ex-context, can be viewed as a 'top-down' approach, or as knowledge transfer from the supply block to the deprived block (Gigler, 2004). In the end, the approach fails to promote local innovative capacity for self-help in alleviating the deprivation and vulnerabilities, consequently prolonging poverty and the digital divide.

1.2.2.2 Perceptions of 'development processes'

A second reason given for why ICTs fail to drive development in DCs, is that there is an inappropriate conception of 'development' as a process. It is asserted that it is now a fact that humans, their environment, and their social factors, are part and parcel of development processes of the people (Sewchurran, 2010). Furthermore, it is said that views that development is a 'linear process' (Hettne, 1995; Shortall, 2004); or even that "ICT can afford agents to *leap-frog* certain developmental stages' (Peña-López, 2009, p.33; Steinmueller, 2001; Trusler, 2004), are ill-founded. Development should not be viewed as being about moving in the steps of the West, or 'a catch up agenda' (Avgerou, 2008; Sewchurran, 2010).

1.2.2.3. Assumptions about functionality

The third factor is said to be that there are inappropriate baseline assumptions being drawn for the operationalization of technology in the host places. It is asserted that it is what people do with the ICT materials that determines their developmental impacts. Toyama (2011) gives examples where the underprivileged communities used the availed '*access*' points for entertainment, playing games, watching movies, or "consuming adult content among the young men as the primary ends" (p.78). Such scenarios are contrary to the intended outcomes of providing access to educational resources, upgrading vocational skills, or providing learning about health practices (Toyama, 2011).

The evolution of ideas on how to maximize the impacts of ICTs on development in developing countries suggests that the working assumptions for deployment of ICTs, need to be further enriched to pave a way for the acknowledgement of their extrapolative, or in Heeks' (n.d) terms, the "extensive role of ICTs" (para. 7) in influencing developmental opportunities. According to InfoDev (2007), it is within the enriched assumptions that vibrant ICT sectors, responsive to, and supportive of social development processes, can be realized in DCs. From the proceedings of the WSIS 2003, it was concluded that such a sector may function to generate an 'Information Society based on shared knowledge' (ITU, 2005, sec. 23, 2010); that is, a society whose economy is technology-driven, and whose members have access to the benefits of ICT equitably.

It is my view that the literature's cited reasons for the failure of ICTs to drive development in developing countries, do not sufficiently explain the baseline factors required for ICT4D initiatives to drive development in DCs. There is a need to trade other factors in the diffusion processes of core ICTs in DCs, beyond just looking at their deliverable values.

In the next section I present my diagnosis to explicate the gap for research.

1.2.3 The thesis diagnosed grounds for the failure of ICTs to drive development

It is the view of this researcher that there are three factors behind the failure of ICT4D initiatives to drive development in ADCs. These are: (1) basing ICT4D initiatives on a too narrow definition of '*digital divide*; (2) a predominance of foreign agency drivers of ICT4D initiatives; and (3) ICT4D packages do not typically include interventions to drive innovative behaviour and the creation of innovation complementaries. These are clarified one-by-one below.

1.2.3.1 A too narrow definition of 'digital-divide'

Ther term 'digital divide' was defined in Section 1.1.4. The cited literature diagnoses that the failure of ICT to drive development in DCs, are based on wrong premises being made in the first place. Recalling that the whole issue in ICT4D boils down to addressing the 'digital divide' (ITU, 2014), it is imperative that the working definition of the phenomenon be as inclusive of the dividing aspects as possible. This should *precede* the process of designing the development and implementation of ICTs to facilitate 'access' or knowledge creation and sharing at affordable cost. A narrow definition of 'digital divide' limits interventions to providing 'access' to broadband (fixed or mobile) outlets, 'use', and 'content'. This is currently how 'digital divide' is conceived by the main flag carriers of ICT4D initiatives, as is evident in documents such as the *Measuring the WSIS Targets: A Statistical Framework* of the Partnership on Measuring ICT for Development (Partnership, 2011). In the ten outlined targets of the framework, targets One through to six all refer to 'connecting…'; targets eight and ten address 'access to…'; and none address local input, such as promoting innovativeness or promoting capacity for production of ICTs as a measure towards immersing technology in the economies of ADCs. For this reason, I propose that there is a need to expand the definition of 'digital divide' to include '*digital innovation divide',* which is an aspect not currently included in the agenda of ICT4D in developing countries. This proposition is in-line with the *Core ICT Indicators* list (Partnership, 2010) that includes ICT goods exports, and ICT sector share of gross value added, which are the outcomes of innovations – this study will refer to these as 'cultivated innovations'.

At the moment, African developing economies are gross importers of expensive ICT goods. As Table 1 indicates, as at 2013, the share of ICT goods as a percentage of total imports stood at USD 21841 million (4.52% of all imports), versus USD 3182 million (just 0.77% of all exports) (Table 1.1) which translate to ICT services costs, and foreground very clearly that the ICT4D are not primarily resulting in innovation, especially not in Eastern, Central, and Western Africa.

Arguably, the effect of adopted a more broad conception of digital divide in DCs that encompasses innovation as well, is important in order to unlock the extension of ICT4D initiatives to include a broader range of socio-economic aspects in DCs.

Table 1 - 1 Share of ICT Goods as Percentage of Total Trade - Year 2013

Region	Imports USD Millions %	Exports USD Millions %
Developing Economies: Africa	21,641 4.52	3,182 0.77
Eastern Africa	2,589 3.49	169 0.48
Middle (Central) Africa	63 0.73	1 0.01
Northern Africa	7,483 3.92	1,750 1.31
Southern Africa	8,892 7.51	1,210 1.11
Western Africa	2,614 3.01	52 0.04

Source: UNCTADStat

1.2.3.2 A predominance of foreign agency-led drivers in ICT4D initiatives for addressing 'digital divide' in DCs

The members of the international ICT4D 'agency' are essentially foreign to the contexts of applied ICTs. They have their own specific interests that are driven by several factors, including their relative economic, political and social relations with the rest of the world. Some are obvious like the economic ones, while others are not. It might be argued, for example, that the economic interests of ICT-goods-producing countries lie in promoting 'use' rather than production innovativeness, as the purpose they are pursuing is to extend and sustain their markets. Aside from different purposes being pursued by foreign agencies, it might also be argued that being 'foreign' to ADCs, leads to a tendency to define developmental issues and prescribe solutions to them, within foreign worldviews derived in very different cultural, political and social contexts. The so-generated solutions are then not perceived within the contextual realities in DCs, and are bound to fail to address the DCs developmental issues in full.

1.2.3.3. Development packages don't drive innovation behaviour and creation of complementary innovations

ICT4D packages lack initiatives to prepare people in the ADC context to take over the driving of innovation initiatives. Apart from pioneering initiatives, local innovators, if in place, should play a role of developing *complementary innovations.* It is through the complementary innovations, that the shortcomings of the pioneering ex-context initiatives would get addressed.

Having stated this thesis' premised grounds for the the diagnosis of failure, a second task remains –to explicate the theoretical and empirical gaps that the failures of ICT4D interventions suggest might exist. This requires going beyond the explanation of the instances of 'success' or 'failure' of innovations (IFIP WG 9.4, 2013), to include locally-embedded, socio-economic aspects, such as social innovation, in ICT4D considerations. I undertake this task in the next section, as it provides a basis for the statement of the research problem the subsequent section.

1.2.4 The gaps that need to be addressed

Two gaps, the theoretical and empirical gaps, appear to exist.

1.2.4.1. Theoretical gap

It was exposed in the preceding sub-section that in their current settings, ICT4D initiatives have neither the supportive frameworks to embed ICT innovations in local economies, nor do they acknowledge local innovativeness as a source of power for ICT4D to drive development in DCs. Thus technology deployment in DCs, and ADCs in particular, continues to be founded on 'technology transfer' and 'top-down' approaches. This points to a theoretical gap. Theoretically, literature on technology, innovation and social change, stipulates that the ontological constructs of social innovation can be well developed if argued along the conception of the subject matter as a 'social process' in a social embeddedness paradigm (Avgerou, 2008; Johannessen, Olsen & Olaisen, 1999; Sewchurran, 2010). Within such a space, economic, social, and cultural structures and historical backgrounds would be afforded consideration in technological innovations. ICT initiatives thus need to be built around an understanding that their impacts are on people at different levels: cognition, affection, skills, and their social-political-economic complex environment (Samoilenko, 2008).

1.2.4.2 Empirical gap

Practices are in place in ADCs to operationalize ICTs for developmental and social transformation ends. Resources are being exploited. It is now 2015, the year that the scorecard of the WSIS' MDGs are due to be assessed. How to make ICT4D interventions in ADCs more productive and sustainable is a crucial knowledge in the community of practitioners. This is the gap in practice. Theoretical constructs are failing to guide practice adequately. In the next section I state the problem for research.

1.3 Problem statement

The problem, simply stated, is that there is a need for adequate theoretical foundations to appropriately guide ICT deployment and application initiatives for effective social development in Africa's DCs. Interventions in ICT4D have failed to address Africa's context development aspects. This in turn has undermined the efforts of the Information Society to achieve and sustain MDGs in the developing world, consequently wasting financial and other intangible resources. The dominant perspectives on how ICTs are related to development in DCs, remain those of people in the developed world looking in from the outside from their own worldviews. Changing these perspectives, requires a different theoretical foundation for understanding the problem situation.

1.3.1 The problem situation

Different ICT-based organizations, such as IDIA, IFIP, ITU, UNCTAD, and others are making considerable efforts to generate ideas to enrich understanding of the operationalization of ICTs for development in deprived communities of the world. Evidence of this is amply manifested in innumerable conference themes, such as '*Alleviating digital poverty with ICT innovation in emerging economies: Will ICT rights make a difference?*' - (IDIA 2012); '*Public and private access to ICTs in developing regions*' (IDIA 2013); '*Into the future*' (International Conference on Social Implications of Computers in Developing Countries (IFIP WG 9.4 2013)); and '*ICTs for inclusive communities in developing societies*' (IDIA 2014) among others.Despite all the developments in research and a large body of conference proceedings on ICT and societies, gaps between theoretical knowledge and applied knowledge in ICT4D are manifest.

The situation is aggravated by the fact that different stakeholders in the regime of ICT4D base their interpretations of the basic concepts in ICT4D on differing worldviews. An

example exists in the way 'use' and 'ownership' of mobile phones are related in the Western worldview, as compared with the situation on the ground in African communities. In the Western perspectives, the statistics of mobile phones ownership can be equated to 'mobile phone use' based on an assumed one (user) to one (phone) relationship, on other words, that the 'owner' is the same as the 'user'. On the contrary, things work differently in many African developing countries, where 'sharing' is a norm (James & Versteeg, 2007). In the African context, family members, friends and neighbours can use one phone that is owned by one of the family members, as also commented by James and Versteeg (2007). The influence of Western conceptions in ICT4D is further exhibited in the dominant interests in research. Dwivedi, Lal, Mustafee and Williams (2009) observe that much of the research work on the diffusion of ICTs, has focussed on conducting investigations on how end-users in the recipient block of ICT4D respond to (Western designed) interventions for addressing the digital divide. Consequently, interventions versus actuality gaps have developed in ICT4D.

In this study, my observation is that the gaps between the *concepts* carrying the ICT4D interventions, and the actual socio-economic situations in the contexts of ADCs, have a tendency of attracting consequences in the context of improving human capacity for ICTs and promoting social and adaptive innovations. Such gaps are negatively impacting the activation of technological innovations for economic productivity and social development in the places of ICT deployment. In such a circumstance, it is even difficult to harmoniously understand how to move the DCs' development agenda forward. Imperatively, there is a need for additional research work in the direction of people empowerment to enhance people's participation in exploiting the developmental transformative potentials of technology within their own ideas of development. This is contrary to addressing pre-defined outcomes, as is also pointed out by Sæbø & Furuholt (2013), who say it is difficult to explain in whose interests the outcomes are, if they (the outcomes) are defined in the worldview of an ex-context world.

1.3.2 Problem underpinning

This research takes a turn from the common practices in the discipline of Information Systems, to explain the relationships between long-term impacts of technology and societies, and the frameworks for practice for those impacts. This means branching away from accounting for successes, challenges, context-conscious design, or context examinations in the implementation of ICTs. The study's addressed problem and its theorization exercise are

pegged specifically onto (1) examining the processes through which ICTs take effect in boosting economies; (2) exploring the gaps between theory and practice in applied ICTs, where theoretical constructs are failing to guide practice properly; (3) and interrogating the adequacy or inadequacy of international, national, and local/individual 'agency' role playing in different contexts of developmental action for development.

This study is an effort to contribute towards the theoretical front of the information systems discipline, starting from the general overarching question of technology for social development that is prevalent in the Information Society (i.e. ITU, WSIS), namely: 'How to influence social transformation for an all-inclusive information society, with potential to fully appropriate the potentials of ICTs for development' (ITU, 2005, 2010; WSIS, 2003). Studies focused on seeking possibilities to replicate practices that have led to positive impacts in some places, in other places, have prolonged the willingness to provide ICT4D sponsorship from international agencies, but the question is yet to be satisfactorily addressed. This is reflected in the emergent questions being asked such as: '*Why are African nations lagging in ICT adoption?'; 'What are the major factors affecting ICT adoption in Africa?*' (Bagchi & Udo; 2007); and '*What in ICT makes life worthwhile*?' (Hamel, 2010). It is also evident in the debates on mainstreaming/side-streaming ICT in development (Heeks, 2010b). The enquiry can be extended to some other unanswered questions, such as: 'How do the sponsored practices for the diffusion of ICTs in developing countries foster the long cry for 'self-cultivated technological innovation'?' (Corea, 2000), or it could be extended to the call for 'local capacity for innovation' (Ainamo, 2007), or the call for 'social innovation embeddedness' (Avgerou, 2008) for effectiveness, efficiency and sustainability, as Sahay (2013) suggests.

Several proposals have been put in place to attempt to address the dissatisfaction by, for example, focusing technology on human development (Hamel, 2010; Sewchurran, 2010). There has been a call for a "paradigm shift" (Steyn, 2011) and a focus on deploying "ICT4D projects against a *social* and *cognitive* paradigm [to effect] social networking and psychological enrichment" (interpretation mine) (p.19). Yet others have called for *bottom-up, socially rooted,* technological innovations as the relevant and appropriate approach for greater socio-economic impacts of ICTs (Avgerou 2008; Corea, 2000; Orlikowski, 2008). And others have emphasised consideration of the target area, context-specific-factors in the design and deployment of ICT (Oosterlaken, 2009). Others have insisted on a 'deep

understanding' of the social aspects in the respective communities, as a necessary pre-condition alongside the technological competences involved (Turpin & Alexander, 2013).

This study positions these proposals as '*constructs constituting a normative frame' for effective ICT deployment*, that explains the '*what*' aspect of ICTs. It is among my assumptions in this study that, apart from the normative set of concepts, the actual practices on the ground in the deployment of ICTs fall short of these constructs, especially for ICT in the context of GPTs when the study's proposed broad definition of digital divide as the *digital innovations divide*, is operationalized. It is also assumed that there is an over-reliance on external inputs instead of local initiatives in the deployment of ICTs in the contexts of ICT diffusion, which undermines the capacity of ICTs to catalyse productivity in those contexts. Thus, this study strives to go beyond the conceptual contributions centred on accounting for impacts as a result of use of ICTs, to instead explore appropriate conceptions of social innovation for long-term impacts of ICT diffusion in DCs. The aim is to cultivate learning for the realization of vibrant, situated agency engagements as a factor for the maximization of ICTs' contribution to social transformation. The scope of the study is limited to developing countries in Africa.

Having now outlined the problem statement and its underpinning, the next section sets up the systematized scientific approach of the study, beginning with the statement of objectives and description of the research question and sub-questions.

1.4 Objective of the study

The main objective of this study is to develop an empirically supported theoretical contribution on Social Innovation (SI) mediated social development in the context of developing countries of Africa. This stems from the main quest as to how to best influence social transformation that guarantees an 'all-inclusive information society', with capabilities to maximize the appropriation of the latent potentials of ICT for development (WSIS, 2005). To enhance the achievement of the stated objective, the pertinent research question and sub-questions follow.

1.5 The research question and sub-questions

The main research question for this study is as follows:

RESEARCH QUESTION**:**

How to best conceptualize the ICT diffusion processes in the context of Africa's Developing Countries (ADCs) for long-term social development outcomes.

For its operationalization, the research question is broken down into four sub-questions as stated below.

RESEARCH SUB-QUESTIONS

1. **What are the contemporary conceptualizations of the operational values of ICTs, and the applied approach / methodology for addressing the digital divide, in the context of ICT4D for social transformation and development in ADCs?**
2. **Are alternative conceptualizations of the values of ICTs and the thesis on 'social innovation', warranted by the prevailing social development approaches or frameworks, specifically the Capabilities Approach?**
3. **How can practice in applied ICTs be aligned with this study's proposed conceptualizations of SI and ICT-GPT for the fostering of ICT-backed development in ADCs?**
4. **Should the state in ADCs intervene in the diffusion processes of ICTs to promote cultivated innovation for development?**

In dealing with these questions, I undertake to re-conceptualize SI as a 'societal capability', from the understanding of social innovations as objects addressing collective needs of societies (Section 1.1.3). In the capability conception, SI can be enhanced to exploit ICT-GPT effectively in societies and their economies. Within this premise, it is my argument that it is possible to realize a variety of combinations of ICT-enriched productive activities in social contexts on the platform of SI. To gain a detailed understanding, I first set out to explore the theoretical drivers of ICT initiatives for development in developing countries. Thereafter, I explore the adopted practices in the promotion of ICT diffusion in ADCs and

their potential or shortfall in generating long-term ICT-supported social development outcomes. This is followed by the exploration for the constructs to support the articulation of my theory template in Chapter 6.

The expected knowledge outcomes of the exploration of the research questions and sub-questions is summarised in Table 1-2.

Table 1 - 2 Research Question and Sub-Questions and their Expected Knowledge Outcomes

Research question	**Expected knowledge outcome**
How to best conceptualize the ICT diffusion processes in the context of ADCs for long-term social development outcomes?	An understanding of alternative theoretical and methodological approaches to ICT diffusion processes that are capable of opening up social development and transformation opportunities in ADCs.
Research sub-question	**Expected knowledge outcome**
1. What are the contemporary conceptualizations of the operational values of ICTs and the applied approach / methodology for addressing the digital divide in the context of ICT4D for social transformation for development in DCs?	An understanding of current theoretical and methodological perceptions on the scope of the impacts of ICTs on socio-economic processes, how these perceptions impact on the diffusion of ICT in DCs, and what the knowledge gap is with respect to ICTs influence on social development via 'social innovation'.
2. Are alternative conceptualizations of the values of ICTs and the thesis on 'social innovation' warranted by the prevailing social development approaches or frameworks (such as the capabilities approach)?	A broad understanding of 'social innovation' in the context of ICT diffusion processes, that is beyond the artefacts worldview and the theoretical baking for that understanding.
3. How can practice in applied ICT be aligned with this study's proposed conceptualizations of SI and ICT-GPT for the fostering of ICT-backed development in ADCs?	An understanding of the correlations or differences between practice and the study's hypothesized constructs on SI, ICT-GPT and SIM. An understanding of the operational potential of the study's hypothesised SI in the current state of affairs in the community of ICT, and the corresponding theoretical and operational gaps.
4. Should the state in ADCs intervene in the diffusion processes of ICT to promote cultivated innovation for development?	An understanding of the available options for countries in ADCs to influence the diffusion processes of ICTs in the favour of their people and economies.

Following on the statement of the research question and sub-questions, the next section outlines the study's research approach.

1.6 Research Approach

The study begins with a preliminary diagnosis of the factors that may be responsible for failed efforts in ICT4D to drive development in Africa's developing economies (countries and economies are used interchangeably in this study). The study opens up the theoretical and empirical gaps addressed with existing theoretical tools in the discipline of Information Systems. The identified gaps are advanced to statements of the problem, the objective, and the research question and sub-questions to guide the study.

The study will explore literature for answers to the specified research questions, and to the viability of the proposed conceptualization of SI and ICT-GPT. The aim is to establish a conceptual framework capable of supporting the theorization and empirical tasks. The capabilities approach will be explored for operationalization in the constructs on embedded SI.

Empirical evidence will be sought to gain insight into the drivers of practices and their fit to conceptual developments. This evidence will be deduced from literature and then mapped in the conceptual framework. The data used will be qualitative text data, making the study a qualitative social research study. The study is organized within the understanding that a 'social world' is subjective to its social members' culture, beliefs and values, and social systems. Thus, it is oriented to the constructivist ontology.

1.7 Importance of the Study

The importance of the study lies in its attempts to address a persistent concern in the discipline of Information Systems; and its significance to applied ICTs.

1.7.1 The persistent issue

There is a persistent quest for contextual phenomena research in ICT4D. The following mini-chronology of expressions below provides the evidence of this. According to Edquist and Hommen (1999), theorizing on social innovation was of an empirically based 'appreciative' nature 'due to infancy' of the field at that time of writing. Baliamoune-Lutz (2003) laments that there are 'ambiguous' conclusions concerning the link between technology use and

economic growth in developing countries, since there is lack of well-developed theoretical knowledge addressing the issues of the direction of causality.

Weber (1997) posited a quest for contributions towards the development of information systems discipline-specific general theories, and the scholar worked on the ontological foundations for such theories (Weber, 1997). A decade later, Avgerou (2008) posited that the theoretical guide for socio-economic contextual questions in the discipline of Information Systems is still weak. In almost the same vein, Heeks (2010) expresses dissatisfaction about the inadequacy of conceptual foundations for ICT impact assessment and the lack of

analytical works in the field, which should be a stage above the one expressed by Edquist and Hommen in 1999. Similar concerns are expressed in the keynote to one of the IFIP 9.4 12th Conference Panels (2013). It was expressed that ICT4D research has generated a significant body of knowledge, with in-depth and rich understanding on the successes, challenges, and local practices in relation to ICTs in developmental contexts. However, that knowledge is based on 'grounded' and 'contextualized' empirical material. At the same time, "*it is recognized that the ICT4D field has not advanced much on the theoretical front*" (IFIP 9.4, 2013, p.23).

Table1-3 provides a summarized chronology of the conceptual dynamics involved in applying ICT for development in the developing world in the timespan of 1990 to the 2010s. The procession of the constructs in the figure is built on the logic of the recent ones, attempting to correct for problems in their preceding constructs.

Pre 1990 into 1990s	**Early 2000s**	**Late 2000s**	**2010s**

Innovations with an emphasis on connectivity and public access • Technocentric approach • Telecentres **Mode of assessment:** Count of access points **Tools:** Statistical parameters	Contextual considerations in ICT innovations. Orientation to design of artefacts to host's local contexts, for ease of facilitating 'acceptance' **Mode of assessment:** Count of user-turn-up at access points **Tools:** Statistical parameters	Addressing social needs with ICT innovations *by 'transfer and diffusion'* *(Avgerou 2008)* Branded as 'social innovation' (SI) **Mode of assessment** Impact assessment **Tools:** Interpretive methodologies	Emphasis on the enhancements for 'socially emanating innovation processes' (or *'locally situated action' (Avgerou 2008))* as the means by which the socially oriented needs can be potentially addressed. **Tools:** The community of practice in applied ICT& the 'agency ' of state sponsor for societal capabilities to innovate

Table 1 - 3 Analysis of the Dynamics in the ICT Innovations Perceptual Themes

1.7.2 The significance of the study to applied ICT

The aspects of the study's significance are at policy and operational levels of applied ICT.

1.7.2.1 Policy level

Policy makers will find this study useful in pinning down the areas of influence that should be specifically targeted for technology uptake in communities, including the specific actions, and the appropriate key role players in these actions.

1.7.2.2. Operational level

The community of practice in ICT4D will find this study useful in 'keying' development partners' interventions for moving development in DCs forward in a sustainable manner. The community will also find this study useful in making conceptual adjustments to the top-down approaches to building digital capacity of developing countries, in favour of solidifying the base for indigenously conceived social innovations.

1.8 The thesis layout

This study is presented in eight chapters and the rest of the thesis is organized as is outlined below.

Literature review (Chapters 2 and 3)

The literature review for the study is covered in Chapters 2 and 3, and serves to unfold the literature along the lines of the first two research sub-questions. These chapters are centered on defending the agenda to conceptualize for ICT-GPT, and let SI stand as a 'societal capability', informed by the scholarship of Sen's capability approach, through which the necessary complementaries for ICT-GPT and their productivity impacts stand to be realised. This framework is suggested as effective for the appropriation of the potentials of ICT for development and social transformation in the world's marginalized communities (IFIP WG 9.4, 2013; ITU, 2005, 2010; WSIS, 2003). The role playing of the 'agency' of the state is constructed in this chapter, and further dealt with in the chapter on theorization.

The literature review culminates into a conceptual framework which is developed as a sense-making tool, and a basis for empirical interrogations to cater for the third research sub-question. This question probes the match between practices and theoretical developments in the field of applied ICT as one side of the coin, and for potential areas needing reconstruction of agendas in practice to better support social development in ADCs on the other side.

Research methodology (Chapter Four)

The technical aspects and approach for the empirical exercise are presented in Chapter 4. The adopted ontology is stated as *'relativism',* and the *'interpretive'* epistemology is used to seek meaning in the agendas surrounding practice. The materials used for data were the descriptors of ICT4D based projects in developing countries in Africa, available in the WSIS Stocktaking and IDRC databases. Data collection approaches, and the tools and techniques for data analysis are described. The Qualitative Data Analysis Software ATLAS.ti 7 was the principal tool used to aid the analysis.

Analysis, findings and interpretation of findings (Chapter Five)

Chapter 5 presents the findings of the data analysis. These findings indicate the presence of 'lags' between theoretical developments and practical targets of the stakeholders' efforts to advance ICTs for social transformation in poor countries. The interpretation of the motives for project initiatives for the propagation of ICT in Africa, indicate that the adopted approach is centred on artefacts which are isolated, and is aimed at realizing impacts immediately after implementation, and are short-term focus and donor-driven. This approach in practice is lacking long-term planned impacts (long-term vision led local input/component, which is essential for the ICT-GPT framework), and it is not building capacity to support domestic

centred innovation processes. Data analysis details and further categorical findings are presented in the chapter itself. The findings are used as strengthening factors for the discussion and crafting of the theoretical product of the study as it appears in Chapter 7.

Discussion of Findings (Chapter Six)

A detailed discussion of the findings is presented in Chapter Six. The findings are discussed against the conceptual framework framed in Chapter Three. The findings are balanced against the constructs for the diffusion of ICT in the capacity of GPT, and the provisions for cultivated innovations in developing countries. The reflections on the research questions with respect to the findings are also presented.

Theory development (Chapter Seven)

Chapter Seven is dedicated to the theorization exercise. SI in the context of the capabilities school of thought and ICT-GPT is theorised, using the framework of a state mediated social innovation machinery (SIM). This addresses the fourth research sub-question. The metaphor of 'organizational transformation' is used to express the possible mechanisms applicable for social transformation in a coordinated manner. Whetten's (1989) scale for evaluating a theoretical contribution is applied to evaluate the theorization exercise.

Conclusions and recommendations (Chapter 8)

Conclusions and recommendations are featured in Chapter 8, together with the possible implications for further research. For specific operationalization of: the proposed social innovation machinery, SI as a societal capability, and ICT-GPT constructs, customization studies in the contexts of application are called for as a necessary prerequisite. This follows from the fact that the context of issues involving social, technology, innovation, and development is a complex one (Turpin & Alexander, 2013).

1.9 Chapter conclusion

The chapter began with the argument that the baseline assumptions at the foundation of ICT4D in addressing developmental issues in DCs are conceptually inadequate. The 'digital divide' phenomenon, which ICT4D intends to address, is too narrowly defined, thus limiting the scope of ICT4D and pertinent research to the constructs of access, use and technology acceptance; leaving out the agenda to immerse ICTs and related innovations in the socio-

economic processes of DCs. I proposed a broader definition that includes 'digital innovation divide' to acknowledge the need to arouse innovativeness in DC contexts. I pointed out that despite practice addressing the digital divide narrowly by concentrating on *operational* issues, theoretical contributions exist in literature that have called for ICT4D's attention in theorizing cultural and political fronts in the context of development. I also pointed at the foreign dominance of ICT4D initiatives, without room for transition to contextually rooted innovations to sustain the initiatives. In addition, I underscored the absence of addressing behavioural components in the ICT4D packages, which are necessary for the emergence of complementary innovations in DCs in support of mainstream ICTs.

Section 1.1 was used to present the working definitions of the main constructs driving the study. The conceptualization of ICTs, the operational understanding of ICT4D, ICT in the category of GPTs, Innovation, Social innovation, Social innovation machinery and ICT receivership' were expressed. In Section 1.2, it was argued that ICT4D should not limit its focus to promoting technology-use as the sole vehicle for technological benefits. This focus impacts adversely on extending enquiries in other possibilities for fostering technology up-take. I proposed telescoping assessments and ICT explorations to the possibilities for developing capabilities for locally-driven innovations that respond to socio-economic drivers from within local communities, based in the interpretations of those same communities. In the context of MDGs, sustainable solutions are eminent, and only obtain in contextual potentials such as social capabilities to innovate. The current scenario, where the focus is on having the recipient communities '*use*' ICT to facilitate their living, has not been able to generate strong ICT-backed economies in DCs, while Europe, America and Asia have evidence of ICTs boosting momentum for economic growth through impacting on factor productivity.

Section 1.3 was used to expand and defend the thesis' diagnosis of why ICT4D fails to drive development in DCs, as hypothesised in the introduction. The relating of ICTs to development through access to information, knowledge sharing and ICT investments was challenged as inadequate in the operationalization of ICTs for MDGs. The ICTs' relating variables were further claimed to be limiting the ICTs uptake processes in DCs. On this basis, the theoretical and operational gaps were exposed as a lack of frameworks to embed innovations in contexts, and change the technology transfer top-down phenomenon in DCs.

It was stated in Section 1.4 that the perspectives on how ICT4D is related to development in DCs, originates from people in the developed world, looking in from the outside, from within

the background of their own worldviews. This has generated theories that look at development as an outcome of the processes of modernizing or transforming communities from backwardness to development. Some literature on development describes development as a social transformation, where people should work to develop themselves, and asserts that development should be worked out through stages, where each stage of development builds upon one another, over time, from within communities' social settings. The claim that is made in this section is backed by social theories which inform that social perceptions are mediated by socially attributed meanings. Thus, looking at a problem from within a community is going to generate a different interpretation from looking at it from outside. This backs the essence of the idea of cultivated social innovation perspectives. It follows that, despite the general theories of development based on utilitarian factors as indicators of development, development concepts are enshrined in social constructions. They are understood from respective societal perspectives.

The research objective was stated in Section 1.4 as being to develop an empirically supported theoretical contribution to the body of knowledge in Information Systems. The objective is informed by the thesis diagnostic of the factors underlying the failure of ICT initiatives to drive development in ADCs as explained in Section 1.3.

The research question and sub-questions outlined in Section 1.5, centre on exploring the theoretical and operational drivers of applied ICTs. The questions are stated in a manner of seeking to gain a deep understanding on the potentials of the literature and thesis constructs for ICT4D. The constructs focus on achieving cultivated diffusion processes in ICT, with an expected outcome of immersing ICTs in the products and productivity in ADC economies.

The research approach was described in Section 1.6 and the study's importance was stated in Section 1.7 and relates to the persistent issue of a need for theoretical drivers of ICT4D on one hand, and its significance in frameworking policies and operations for ICT interventions for development in DCs on the other.

Having laid out how the thesis is organised in Section 1.8 and concluded this chapter, I turn to the review of literature related to the first two research sub-questions in Chapter Two.

CHAPTER TWO: Review of Literature - Theoretical Perspectives of Applied ICTs

2.0 Introduction

The narrow conceptual base of the factors that constitute the 'digital divide' in DCs, affects the range of choices of the specific ICT interventions, and the methodological approaches that are used when these are implemented. The selected methodological approaches, in turn, limit the depth to which ICTs can penetrate into the social, economic, and strategizing activity of the DCs in the technology diffusion processes. This phenomenon prompted the desire to seek enriched conceptualizations of operational factors in the technology diffusion processes taking place in DCs. This exploration is led by the stated research questions (Section 1.6).

With regards to the roadmap for the reviewed literature, Chapter Two focuses on the first two research sub-questions, namely: (1) interrogating the contemporary conceptualizations of the operational values of ICTs, and the applied approach or methodology for addressing the digital divide in the context of ICT4D for social transformation for development in ADCs; and (2) exploring alternative conceptualizations of the values of ICTs and the thesis on 'social innovation', based on social development approaches or frameworks, specifically the capabilities approach.

The third research sub-question on how applied ICT practices can be aligned with the study's proposed conceptualizations of SI and ICT-GPT, is covered in Chapter Three; while the fourth, on '*should the state in ADCs intervene in the diffusion processes of ICTs to promote cultivated innovation for development and how'* is addressed as a basis for theory development in Chapter Seven.

The rest of the chapter proceeds as follows: Section 2.1 explains the operational conception of 'digital divide' and ICT, as well as the contemporary theoretical, methodological and empirical perspectives in applied ICTs. Section 2.2 presents the study's proposed conceptualization of the process of technology diffusion in ADCs, and Section 2.3 presents the chapter conclusions.

2.1 The study's adopted operational conception of ICT and 'digital divide'

My principal argument in this study is that the internal and external efforts must work together to push ICTs to the core of economic processes and economic relations in the economies of ADCs. It is my observation that when ICT4D narrowly addresses the digital divide with an approach that tends to simply target problems in ADCs, two inherent problems become evident: First, a narrow approach is problem-solving-centric in the short-run spectrum, and second, a narrow approach to the digital divide fails to address innovation gaps that are necessary for endogenously-operated economic performance in ADCs, thus limiting the depth to which ICTs can penetrate in the economies of ADCs.

These observations prompt three basic questions: (1) What are the theoretical perspectives underlying the operations of ICT4D in DCs?, (2) How are ICTs related to development as far as ICT4D in the context of ADCs is concerned?, and (3) How do these perspectives work to promote or limit the effectiveness of practice to influence development in applied ICTs?

To answer these questions, it is necessary to review the theoretical, methodological, and empirical fronts of ICT4D and identify the packages of ideas at the centre of operational values of ICTs, and the applied approach in the deployment of technology for development in DCs. The exercise also requires reviewing the activity in applied ICTs, at the levels of the perspectives on: the digital divide (Section 2.1.1.1); ICT-GPT; the conduct of the technology diffusion processes; and the human-centric activity of innovation.

The significance of these singled out aspects is first, that these same aspects sit at the decision making doors of donor or sponsor agencies, governments, and other development organisations in ICT4D in the first place; and second, that these aspects answer the first research sub-question. The identified discussion fronts are discussed in turn in the next sub-sections.

2.1.1 The Theoretical front: Perspectives on the digital divide and ICT-GPT

2.1.1.1 The digital divide revisited

The evolving concept of 'digital divide' was defined in 1.1.4 and is further developed here. From a theoretical point of view, the digital divide is described along different dimensions, and includes operational, cultural and political dimensions (Steyn, 2011; Tongia & Subrahmanian, 2006). According to Steyn (2011), the operational divide - which concerns availability and access to ICT systems, can be addressed by implementing infrastructure for

ICTs and access gateways. For the other two categories, Steyn (2011) suggests people empowerment is required, so that the people can have insight into knowledge sources and exchange, for purposes of influencing change. In addition to the operational divide, Tongia and Subrahmanian (2006) list other divides, such as divides between ICT professionals and development professionals, and divides between stakeholders – such as academia, industry, government, funding groups etc. The limits set by the scope of this study, mean that I will not pursue the description of the latter descriptions, but instead focus on operational descriptions.

Practically, the interventions in applied ICTs are driven by the *operational* type of divides, which strive to implement communication infrastructure and access. In such cases, many aspects of ICT4D as an agent of social benefit and economic growth (Stahl, 2008) remain excluded, such as implementations aimed at building internal capacity of communities to innovate for their living.

With this study, I view the construct for social innovation in the lenses of the Capabilities Approach as being complementary to the already called for paradigm shift suggested by Steyn (2011), as it has a focus in innovation and organised diffusion processes of ICTs, for the realization of interrelated aspects of human, social, and economic upliftment. My declared belief is that if people can innovatively engage with ICTs in different forms, they will, in all likelihood, become able to realize and exploit the opportunities available in time.

2.1.1.2 ICTs and the digital divide revisited

Revisiting the constructed working definition of ICTs from Section 1.1.1, ICTs are understood as covering a variety of technological innovations for the facilitation of information processing, packaging and dissemination. In an international setting, developed countries have more capabilities to exploit the benefits of those innovations than the developing countries. This is what entails the 'digital divide' even in the eyes of literature (ITU, 2009; Heeks, 2002; Prieger, 2002). There are three dimensions to this understanding of ICTs: (1) developing technological innovations, (2) using the innovations for the management of content; and (3) the ability to use the deliverables of the innovations and content. To address the digital divide in DCs, a balanced approach is essential, in order to generate capabilities for developing innovations; use innovations to manage content (process, package and disseminate information); and use innovations for their carrying value or deliverables (accessing information; social, educational and business networking; etc.).

For the stakeholders in ICT4D the concern dwells on helping or enabling the party on the deprivation side to appropriate the carrying values of ICTs. This sets the context in which facilitating access to broadband and Internet outlets ubiquitously (Section 1.3) is persistently pinpointed as a principal action line of ICT4D. This choice influences the prescribed ICT packages, their design (Tongia & Subrahmanian, 2006), development and implementation.

Practically, it is not in the interests of international development organizations and donors to support the development of technological innovations themselves in the ADCs, which is another facet of 'digital divide' in its broader understanding of the phenomenon. Addressing the digital divide in its narrow terms has two unpleasant consequences to the success of ICTs to drive development in ADCs. The first is that it promotes problem-centricity in the conception of ICT solutions to developmental issues. In turn, the problem-centricity scenario begets focusing on problem-specific artefacts which have failed to drive socioeconomic transformation in ADCs. The shortcomings of 'artefacts' (which were defined in Section 1.1.7) are discussed in more detail ahead.

The second consequence of narrowly addressing the digital divide is that the practice is limiting the space for addressing ICT diffusion with situated technological innovations, where the local innovators get conceived. In my observations, the ADCs can transform their world in their own favour from within. The force and potential to do so is within, and the knowledge about it (the potential) abides with the agencies within. It only needs a careful assessment of the environmental contexts within to locate the condensation points (snowballs) for innovations. This is elaborated on more in the conceptions of ICT-GPT as below.

2.1.1.3 ICT-GPT

A working definition of ICT-GPTs was given in Section 1.1.2. In totality terms, ICTs fall within the category of GPTs that are not confined to any specific sector of economies. The impacts of GPTs are normally realized in many forms and settings. Evidences from around the globe testify that the economies that have implemented ICTs successfully have achieved substantial economic and social benefits through the related impacts they make in a network of economic sectors as GPTs.

ICT research based in advanced economies indicates that ICT has influenced economic and social transformation mainly through promoted labour productivity, and direct output contribution to GDP.

Thus, ICT4D may be more successful than it is now, if it included, in its packages, efforts to influence factor productivity (of labour and other categories of capital) and direct contribution to GDP. This entails acting on the cores of economies and the innovative behaviour as a social factor in the target contexts of ADCs. The lack of these components is seen in the dormancy of local agencies (individuals and states in ADCs) who do not play an active role in innovatively anchoring ICTs in the core activities of their economies.

The next section addresses the methodological front of the exploration by reviewing the perspectives on the diffusion of technology and the conceptions on innovations in its medium.

2.1.2 The methodological front: Perspectives on innovation and its impacts on the diffusion of technology in ADCs

Technology diffusion was defined in Section 1.1.3. Literature on the '*diffusion*' of ICT-based innovations in the places of deprivation, has been moving along five conspicuous lines of thought. The first line is on *pushing* for '*acceptance'* of innovations through addressing user-centric characteristics such as: *skills of a user* to use an innovation*, awareness* of the user regarding an innovation, perception of use of an innovation by the user, etc. (Dutta & Mia, 2011; Jain, 2006; Ochara, Van Belle & Brown, 2008; Ospina & Heeks, 2011). The second line is pull oriented, addressing innovation-centric characteristics: ease of use of an innovation, known impacts of an innovation, problem solving orientation of an innovation etc. (Bankole et al., 2013; Chigona & Licker, 2008). The third line can also be categorised as a pull motivator as it addresses the relevance-to-context-centric characteristics (Avgerou, 2008; Grazzi & Vergara, 2010; Reijswoud, 2009a). The central motive in the first two lines is to complement technology transfer with effectiveness in the places of adoption. The third line aims at developing some custom characteristics in the innovations.

The focus of the fourth line is the policy arena. The central ideas in this line of thought rest on policy implications for governments in recipient places, to extend the impacts of technology to socio-political, cultural, and institutional spheres (Zheng & Walsham, 2008; Heeks, 2010a). The last line focuses on creating 'possibilities' for leveraging large scale and deep, socio-economic change, in a transformative way (Avgerou, 2008; Ospina & Heeks, 2011). Hanna (2003) and Avgerou (2008) are among many who have further advised for ICT technological outlooks to be enshrined in broad national development strategies, for optimal utilization of ICT outcomes.

The outcome of the theoretical developments in the first three outlined directions are, to a greater extent, a push for crafting technological interventions, or artefacts, developed to accommodate the purportedly necessary contextual features for their uptake (Heeks, 2008; Murray, Duran, & Yeomans, 2002). Unfortunately, artefacts are noted to bear no solutions for ICT-mediated social transformation for development. For instance, centering on ICT impacts to promote technology uptake is criticised as being based on addressing pre-defined outcomes (Sæbø & Furuholt, 2013) yet not being effective. The approach is abstract to contexts, however it strives to observe for context-specific factors and it is artefactual based. The term 'abstracted artefactual approach' is used to describe a situation where technological innovations have been developed outside, then deployed into places of use for their expected impacts or solution to some existing problems.

But what is wrong with artefactual centricity? In the next section I explore literature for the views about it, in the end establishing the position of artefacts in the general technological diffusion processes of ICT-GPT in a positive way.

2.1.3 Artefacts in social innovation and diffusion of technology

A working definition for artefacts was set up in Section 1.1.7. There are arguments in the literature that a technological innovation or an artefact created in one community, bears the identity of that community and its people (Flores, 1998; Reijswoud, 2009; Mutenda, Mpazanje & Chigona, 2011). Since the designers are people with certain backgrounds, it is inevitable that during the design, the designer will inscribe into the artefact the identity of that individual's virtual world (whether done so consciously or not). To work in another community, the artefact has to be peeled off of the former human identity before any meaningful replication can take place (Mutenda, Mpazanje, & Chigona, 2011). To what extent this mechanism can work, remains a question since one has to first be certain of the part of the artefact that is 'neutral,' if people and their technology can be separated at all. The reason is because technologies evolve with people as social thoughts. Technologies do not emerge and exist on their own (Orlikowski, 2008).

Artefacts viewed in the context of ICT-GPTs, can emerge from within a community in the process of the diffusion of a major innovation. This results in an outcome of that community's social innovation processes. Such emerging artefacts stand to succeed for the reason that, in the process of their development, the necessary linkages with other relevant social players (e.g. people and institutions) also emerge in situ. In addition, within the social

innovation domain, adjustments to ideas are made by the people themselves. For instance, people may dismantle a new innovation from within or from without, to re-create it in their own way which is more meaningful to them. In the words of Orlikowski (2008, p.255), "as people interact with a technology in their ongoing practices, (they) enact structures that shape their emergent and situated use of that technology" (p.255). This is an advantage over the types of vicious circles explained later in this section and shown in Figure 2-1.

A defence in this regard can be found in Flores'(1998) contribution that human beings do not normally act in the world by simply *transferring, disassembling, and reassembling* encounters, such as new innovations in the senses of those innovations' origination. In other words, in the process of disassembling and reassembling, the status of the concerned innovations "is also changed to let them correspond with the respective humans' communities' contextual sense making" (Flores, 1998, p.353). Even in the case of the 'technology transfer', Avgerou (2008) has maintained that technology integration stands to be most successful when the level of interaction between the source of the technology and the recipient of the technology are appropriately matched, or fit the characteristics of the technology to be integrated. This is also observed by Rai, van Belle and Pedersen (2010).

In many cases, literature on diffusion of innovations has perceived the tacit decline of host communities' capability to adopt innovations meant to help them get out of some economic or health ills, to be '*resistance'* to technology adoption (Dalvit, Muyingi, Terzoli, & Thinyane, 2007). In the real terms, a different worldview is required to interpret the decline, such as the assumption that adopting an innovation is an act of consumption. If one understands people to be so-called 'rational' consumers who make decisions on whether to take an innovation or not on the basis of available information (Becker & Murphy, 1988; Tellis & Gaeth, 1990), they would not be assumed to be *resisting* to adopt technology. Instead, it could be put forward that there are complex mental calculations and processes that people go through before they make choices on anything new.

In social contexts, when no collective sense-making of new innovations is realized, the object is rejected. This is not '*resistance*', as the superior/inferior dichotomy worldview would label similar phenomena, for instance in the case of Kim and Kankanhalli (2009). In the real sense, the people in context may be seen to have simply not made a commitment to the object.

In the interpretation of technology transfer, artefacts tend to be an abstracted imposition in the communities of relevance.

Accordingly, an artefactual approach to diffusion of innovations in the areas of deprivation, is a problem-solving driven innovation scheme, which may be viewed to be trying to address social problems simultaneously (Heeks, 2010a). That is, if the approach could work, then an inventory of problems would be taken up by the designer community for developing solutions to them (Oosterlaken, 2009). This is branded 'techno-centricity' in other works (Heeks, 2008; Sewchurran & Petkov, 2007).

The danger pertinent to *techno-centricity* is that it can potentially lead to a vicious circle of technological dependence, as depicted in Figure 2-1.

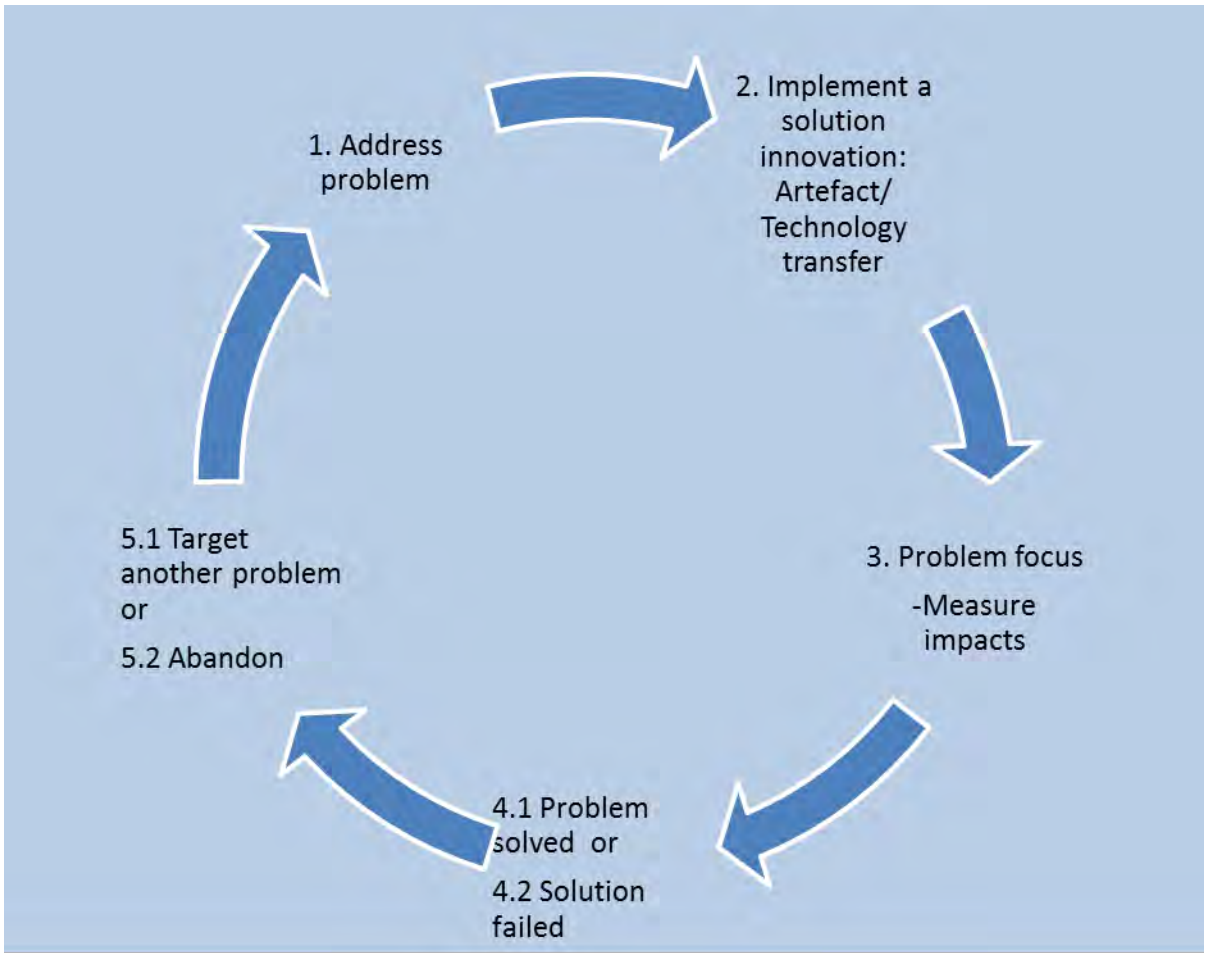


Figure 2 - 1 The Vicious Circle of Technological Dependence

There are five steps in the vicious circle of technology dependence outlined in Figure 2-1.

1- Address a problem: This shows the focus of the intervention, which is to address a certain problem, normally defined ex-community, such as in the context of MDGs.

2 - Implement a solution: This depicts the general case where technological innovations or artefacts are introduced to communities to tackle problems of poverty, health, education, child birth, etc. The intention is that such artefacts will help to connect the local community with external sources of basic information related to solving the respective problems (Heeks, 2010b). Since the origination of the artefact is foreign, with very minimal local technological inputs, the artefact is technically a technology transfer.

3 – Problem focus. This depicts the expected areas of the problem to be impacted upon by the intervention. These are stipulated as observable and assessable. When assessed, they give a picture of the outcome.

4 - Scenarios of the outcome may reflect that a problem was either solved or the solution failed.

5 – Target or abandon. In the case of a problem solved, another problem is targeted; if not, then a decision is made to either change a strategy, or abandon the project. The latter happens to be the dominant case in the limitation of the inflow of foreign resources (finances and technical know-how) according to contracts.

Such circles are rigid to break. For instance, where the problem regarding addressing initiatives is in the hands of the donors, the same own the necessary financial and knowledge resources and they are at the same time observant of their own economic and political interests.

The low success rate of artefacts in DCs to tackle poverty issues, has prompted the technology theorists to propose that a change in strategy and policies guiding the implementation of ICTs for development is required. Some of the propositions are in favour of an 'inclusive information society' in DCs, that considers 'access' and 'connectivity' together with other factors of human development, gender and age in the ICTs' initiative frameworks (ITU, 2010; Peña-López, 2009). Yet, such propositions are still focused in the 'user' plane, which may not yield significant, long-run, sustainable, social transformation results, as was noted by Morales-Gómez and Melesse (1998).

In the deep analysis of the features of artefacts, it is not difficult to realize that the issues in ICT for development in developing countries are less related to '*technology acceptance*' or '*diffusion*', and more related to local capacity enhancement for the creation of innovations by the concerned people themselves. Consequently, the artefacts that do not originate from within the same economies they are supposed to serve, are not relevant enough as social

constructs. They tend to be inherently lacking on the necessary social inputs from the host communities. To what extent local capacities is in fact a concern of applied ICT4D, is an evaluation left to be answered by the empirical part of this study.

The second discussion question posed in Section 2.1 was how ICTs are related to development in ICT4D in the context of DCs. This is explored in the gridlines of applied ICTs approaches again in Section 2.1.4, because the baseline of the efforts in applied ICTs is to drive for development in the places of application.

2.1.4 Artefacts and development in the medium of Applied ICT – a behavioural conceptualization

Literature on '*diffusion of innovations'* suggests that artefacts discussed in the above subsection are not carriers of development. In other words, *development* does not get designed in objects/artefacts like Telecentres, Information Communication Systems, Computers, or Computer networks. Rather, development is a behavioural concept that gives forth material objects (Corea, 2000; Winograd & Flores, 1987). Following this thread of knowledge, it can be inferred that development is enshrined in behaviour just as poverty is. This may be why there are poor people co-existing with the rich, in materially rich places, where both may be facing unrestrictive conditions to access of livelihood assets. For instance, one does not need ICT to keep one's home surroundings clean in order to fend off diseases and save on resources used for medication. It is not a question of technology to adopt good farming practices for environmental conservation where they are known, or hard working fruitfully.

Within the same grids of argument, development can be considered to be a process, grounded in behaviour (Corea, 2000), technology (Avgerou, 2008) and ideology (Chacko, 2005). Accordingly, technology cannot be successfully applied for development in the absence of behavioural and ideological considerations in the communities of relevance; and yet these are elements that are lacking in the current methodological approaches of ICT4D. Motivation, aspirations, and role-playing at the level of individuals as agents, drives the behaviour of actors. Innovations drive technology to devise tools for both social and economic activities. Ideology begets the necessary institutions, policies and strategies to guide the process of development (G8, 2000, p. 8). Ideologies are commonly owned by societies, and they have to be articulated and implicated in practice.

For instance, if technology is to be activated for the realization of the MDGs (ITU, 2005), the respective places in Africa's DCs must have definite ideologies for that. The three aspects – of behaviour, technology in the notion of innovations, and ideology, form the heart of SI and SIM in the understanding of this study.

The context in which the construct '*ideology*' is used needs to be clarified, and I do that at this stage. Briefly presented, ideologies have been conventionally held as political ideas, beliefs and attitudes that involve the adoption of practices that explain, support, justify or contest socio-political arrangements; and /or provide plans of action for public political institutions (Freeden, 1998). According to Freeden (1998), ideology emerged out of: (i) the attempts to account for 'the world around us' (ii) some individuals and groups' desires to have dominating and control power over others, and (iii) the tendency to segregate 'thought' from 'action'.

In the application of the 'ideology' terminology, the upheld notion is that expressed by Freeden (1998), where the literal and not phenomenal meaning of the term is deployed. Freeden precisely describe the Karl Marx's notion of 'ideology' in political spheres, where it has been used to express situations of brain-washing, exploitation and power alienation (Freeden, 1998, 2003; Marx (n.d) in McLellan (1977). Freeden (2003) stipulate ideology as a tool to communicate claims on political or economic attributes, structures, etc.

In the adopted Freeden's attributed meaning, ideology is used to represent:

> *"the actual and thought-patterns of individuals and groups in a society which relate to the way they comprehend and shape their political worlds, and supply us with crucial clues for understanding political conduct and practice"* (Freeden, 1998 p.749).

Ideology is important in that it is the underlay of practices and individual agency behaviour (Boateng, Heeks, Molla, & Hinson, 2008). Ideology is a social dimension, structured in social contexts and regulative on agency as grounded in the structuration theories (Giddens, 1999). Furthermore, ideology takes into consideration the social-historical reasoning of respective communities. Ideologies sit in the background of social innovation to describe the functioning of the construct in the broader governing economic models and given economic bases. The economic base and deployed economic models will in turn dictate on the institutions and social innovation policies, as well as the strategies to be deployed, and the objectives, especially where such initiatives are emergent from within the society. The outline of policies, the marrying of national and international declarations and policies and their

coordination, are considered to be effective when regulated by the respectively locally existing ideologies. Ideologies tend to annotate the socially maintained identity.

Ideology is drawn into this discussion involving the diffusion of technology in ADCs, because it centres the argument on the current scenario of the dichotomy of technological advancement in the world. The technologically backward economies need to be strategical about technology uptake, so that they can beneficially appropriate the opportunities of innovations. Failure to do so, will keep these economies on the disadvantages side of technology-led growth. For instance, they may become the dumping place for the innovations that become obsolete in other places. They may also keep wasting their meagre foreign financial resources on sophisticated technologies that generate no economic gains domestically. The other factor is that such economies will keep on appropriating the consumption utility of technology, without benefiting from the productivity improvement it could generate.

It appears that how technology should be appropriated, can be determined by carefully selecting strategies and explicating the relevant ideology to the actors in an economy. An example of ideology is a stated and actioned theme, such as 'we want to be self-reliant on basic technology'. Then the following actions have to reflect the ideology as the foundational idea of all members in an economy.

The advanced aspect of development is social transformation. Social transformation involves changing the socio-economic lives of the people (Dwivedi et al., 2009; Orlikowski, 2008). When living amidst technology, people interact with it in their on-going practices, absorbing it in their social factors such as education, health, culture, business, agriculture, media, etc., in the process undergoing changes in form and function (Orlikowski, 2008).

Developmental social transformation then refers to societies taking on new forms of life. This is an outcome of development defined as a result of increments of favourable tangible and intangible qualities. In the long-run, such increments accumulate to significantly notable differences along the time spectrum, in terms of time before and time after any chosen reference point. This is then noted as a change or a desired transformation. Implicit in this notion is that the material things people invent, use and adjust over time help them on the trajectory as they take on different forms of life, and are regarded as tools. The point in focus is that such material things are not specifically 'designed for development' (the 4D in ICT4D) or poverty alleviation; they are merely outcomes of certain favourable processes.

In summary then, to have developmental impacts, artefacts in applied ICTs must bear behavioural components, and ICT4D at large must enhance ideological and other local inputs such as institutional constructs. Alternatively, artefacts need to be understood as instances that are not definite on their own, but sit in the broad context of ICT-GPT. More elaboration on this follows in the next section.

2.1.5 Enhancing artefacts in ICT-GPT

Research in ICT applications for development has held artefacts as agents that should be operationalized for social change, the idea being that artefacts need to be appropriately designed and delivered to the places of need so that they can bring about desired changes in communities of relevance (Andrade, 2011). But, as was observed in Sections 2.1.2 and 2.1.3, artefacts tend to be abstracted from reality, and the propositions for their impacts are generated in abstract. This causes them to fail in social settings that are different from their places of origination.

An alternative understanding to the functions of artefacts in social change processes, can be developed by regarding artefacts as instances in a broad perspective of GPT diffusion processes in a social context; in other words, letting artefacts emerge as products of social innovation- capabilities. In such circumstances artefacts are given a position of 'social phenomena'. For instance, in the argumentation of Mulgan (2006) and Sewchurran (2010), social innovation happens through the people, where developments in the innovation dictate the required adjustments in technology to make it function satisfactorily.

In the analysis, the dependence on, and accumulation of artefacts as the carriers of technology for development in places of deprivation, is an outcome of the dominant impacts-centred studies in ICT (Dwivedi et al., 2009). These have a tendency of stressing 'replications' of ICT (Bankole et al., 2013; bin Ibrahim, Sulaiman, & Faziharudean, 2010). At the same time, the witnessed low returns on the abstracted artefactual approach have instigated the ideas for innovations with a social focus, in addition to poverty and other social-ills problem-solving.

In place of discounting the abstracted, artefactual-driven, ICT intervention action however, I choose to investigate the broad GPT diffusion processes at large in relation to ICTs.

Such an approach enables the positioning of technological innovations as artefacts in one frame, while allowing for the crafting of a unified SI framework that is effective for social transformation, in place of addressing social problems in abstract (Section 2.1.1). Other advantages of such a framework relate to cultivating inward looking strategies for ICT that

are more responsive to local conditions; and long-term alleviation of external dependencies (Carmody, 2009; ITU, 2012; Reijswoud, 2009; Stillman et al., 2010).

The last area for the discussion is the empirical front. Addressed in this front is the coverage of practice in ICT4D along the identified dimensions of ICTs. This is briefly presented in the next section.

2.1.6 Empirical front: Practice grounded implications of applied ICTs

In Section 2.1.1 I identified three dimensions of ICTs, which are also mapped in Figure 2-2. A balanced technology diffusion process is expected to develop competences in each of the projected dimensions: development of innovations, content management, and appropriation.

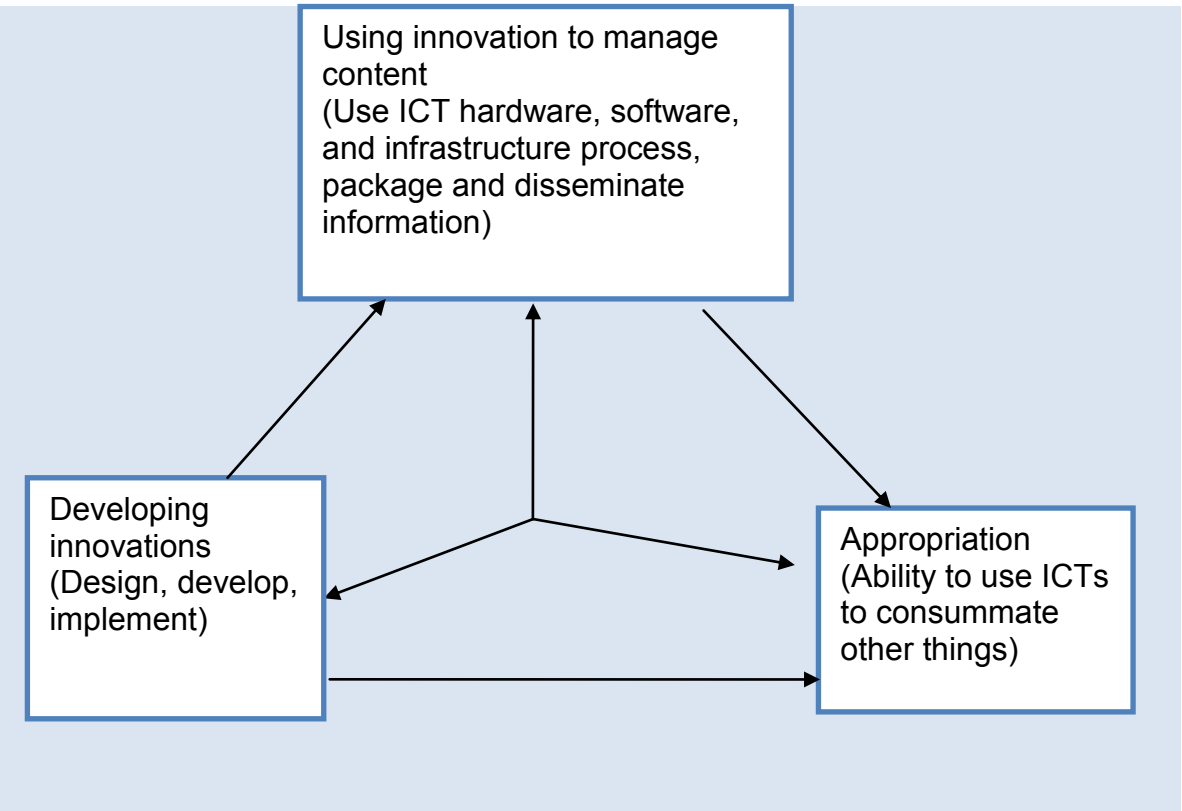


Figure 2 - 2 The Dimensions of ICTs

Deducing from the literature on the digital divide, diffusion of innovations, MDGs, etc. provides evidence of the interest of applied ICTs. The common agenda is to push, pull, or provide incentives to appropriate the informational value of ICTs.

This is seen as basic, and it blinds the eyes from seeing the technology diffusion and economic opportunities in other dimensions. Consequently, there develops a cross cutting gap across the theoretical, methodological and empirical fronts.

With respect to the main argument I forwarded in Section 2.1, that the internal and external efforts must work to push ICTs to the core of economic structures and economic relations in the economies of ADCs, neglect of diffusion on the dimensions of developing innovations hinders the required ICT deepening.

This section is further complemented by the exploration of practice for the grounded implications of practice in Chapter Five. In the next section I will present the second research sub-question on *'exploring for alternative conceptualizations of the values of ICTs and the thesis on SI'*.

2.2 Alternative conceptualization for ICT deployment and the pertinent impacts

In expressing alternative conceptions, my purpose is to establish a new position in the deployment of ICTs in the economies of ADCs. My focus is on the alternative understanding of the technology diffusion process and the factors that are capable of driving the diffusion. This is a shift from the dominant themes in applied ICTs research, which has persistently concentrated on: the search for explanatory factors for the low uptake of ICTs in African economies (2007); the investigation of incentives to stimulate the adoption of ICTs (Verdegem & Verhoest, 2009); and the investigation of possibilities to replicate technological solutions in the places of deprivation by focusing on useful impacts experienced in other places (Bankole et al., 2013). In the ordinary themes, the bottom line is the understanding that ICTs have solutions for African nations' developmental problems - specifically poverty, only if those countries can successfully adopt ICTs.

In general terms, the analysis of literature on ICT uptake displays a stance that blames the lagging in ICTs adoption in Africa's DCs on the people of those places and their contexts for being resistant to technology uptake. The category of the research questions dominating research on the phenomenon, and the type of recommendations that research develops - such as 'creating awareness', 'considering cultural factors in the design', and 'motivating for use of ICTs' (Kim & Kankanhalli, 2009; Lwoga, 2010; Mlitwa, 2010), provide a support for this observation.

The alternative conception I am building abandons the ICTs one-to-one relationship to solutions understanding, proposing instead that it is the innovativeness of the people concerned that give relevance to ICTs and the deliverable impacts. Furthermore, I emphasize that insisting on pressing for adoption of ICT innovations for use, without setting a grounds for grounded innovations, is not a viable solution for effective and sustainable ICT innovations in Africa's DCs. Why not look in the processes that have enhanced strong, long-term, socio-economic ICT-bases in other places for lessons?

With this in mind, the literature can be explored for such lessons, in order to build a foundation for the theorization of social innovation. The issues discussed the following sub-sections include the fundamental perspectives of ICT: ICT as a source of output and productivity growth; and the conceptualization of SI for the proposed ICT-GPT diffusion processes. I begin with the fundamental perspectives of ICT.

2.2.1 The fundamental perspectives of ICT for the diffusion-process-centric social innovation

The concept of *'technology diffusion'* was defined in Section 1.1.3 and further explored in Section 2.1.2, and is conceptualized further here. It has been widely used in literature to capture perceptions from a variety of frames, specifically the producing, the user, and the diffusion mechanisms planes of innovation spread (Bresnahan & Trajtenberg, 1995; Cette et al., 2005; Hamel, 2010; Helpman & Trajtenberg, 1996; Jalava & Pohjola, 2007; Jovanovic & Rousseau, 2005; Rohman, 2012). This is the broad sense of the term. In other literature, 'technology diffusion' is used equitably to the 'adoption', 'acceptance' or 'uptake' of innovations or artefacts in the places of deprivation (Ewusi-Mensah, 2012; Jasperson, Carter, & Zmud, 2005; Legris, Ingham, & Collerette, 2003; Lyytinen & Damsgaard, 1997). In the proceeding discussion, the term 'ICT / technology diffusion' will be used in its broad sense.

The concept of ICT-GPTs was defined in Section 1.1.2 and further developed in Section 2.1.1.3. ICTs are among the GPTs that have brought about overwhelming changes in the world economies (Basu & Fernald, 2007; Bresnahan & Trajtenberg, 1995; Crafts, 2004; Jalava & Pohjola, 2007a). GPTs are acknowledged as radical innovations that in many cases play the role of influencing revolutionary changes that transform household lives and the way firms conduct businesses (Dwivedi et al., 2009; Jovanovic & Rousseau, 2005a).

Other descriptions regard such technologies as 'major technologies in historic eras' that have been able to create sets of opportunities and constraints for innovative activities in other

major innovation lines (Castellacci, 2008a). GPTs are known as 'enabling technologies', that are 'pervasive', and capable of opening up new opportunities (Bresnahan & Trajtenberg, 1995; David & Wright, 1999a; Hamel, 2010a; Helpman & Trajtenberg, 1996a). GPTs are pervasive in the sense that, after being produced in one sector of an economy, they are usually used as inputs by other sectors, branded as 'the user sectors'. The user sectors take advantage of the GPTs by innovatively engaging them in their own core competences (Bresnahan & Trajtenberg, 1995; Hamel, 2010a; Helpman & Trajtenberg, 1996a). In the process of GPTs penetrating economies or diffusion, 'complementary investments' and 'technical changes' develop in the user sectors of the GPTs (Bresnahan & Trajtenberg, 1995; Castellacci, 2008; Helpman & Trajtenberg, 1996). Complementary investments are the necessary investments that take place in the user sectors or communities to enhance the loading of a new technology, for instance investment in infrastructure and training (Rohman, 2012).

Literature on the economics of technological innovations tend to use 'technology diffusion' as the term with which to describe technical changes in the process of their uptake (Bresnahan & Trajtenberg, 1995; Jovanovic & Rousseau, 2005a). 'Technology acceptance' is a term used to refer to the adoption of technology (Davis, 1989; Lee, Kozar, & Larsen, 2004) in the contexts of users such as firms (Goldfarb, 2005), or communities (Lee et al., 2004). This derives from the fact that there is always a time lag between the arrival of a technology and its uptake for economic gains (Helpman & Trajtenberg, 1996; Jovanovic & Rousseau, 2005). Studies based on the diffusion of technologies indicate that the time differential between the introduction of an innovation and its economic uptake, has a role to play in the determination of the realization of the benefits associated with it (Goldfarb, 2005; Rogers, Singhal, & Quinlan, 2007). Since economic units adopt technologies at different rates (Rogers, 2003; Rogers et al., 2007), Helpman and Trajtenberg (1996) use that characteristic to describe technology diffusion as a 'process' with definite, characteristic, time profiles from the perspectives of the technologies themselves.

Related to the GPTs' pervasiveness characteristic, technology innovations are known to be complementary to others; the phenomenon which technologists describe as emergence of 'innovation complementarities' (Bresnahan & Trajtenberg, 1995; Helpman & Trajtenberg, 1996). Innovation complementaries are the innovations, such as process innovation, that develop in firms or sectors with complementary relationships with the GPT (Pavitt, 1990). Innovation complementaries are very important in the diffusion of any new technology as

they lead to important inter-sectoral knowledge exchanges and linkages between interrelated branches of economies (Castellacci, 2008). In essence, this characteristic paves the way for the holistic evolution of economic units, promoting a conjoined productivity of factors and sectors in an economy, and allowing for inbuilt sustainability potentials. In the absence of significantly developed innovation complementaries, the penetration and sustainability of, say, artefacts developed in one economy and then transferred to another place for use, remain weakly linked to other economic units in the new place.

The study by Dewan and Kraemer (2000) in 'IT productivity across countries' has revealed the existence of a significant difference in the IT capital investments' share of GDP in developed countries and Africa's DCs. For the developed countries IT capital investment was 53% of annual GDP, while it was not statistically significant for the counterpart DCs. The authors of the study account of this phenomenon saying*: "Perhaps […] developed countries have already made complementary investments in infrastructure, human capital, and in-formation-oriented business processes, which can be leveraged by new IT investments for higher payoff*" (p.550).

The results in another study, by Bollou and Ngwenyama (2008), focused on *total factor productivity (TFP)* as an impact of ICT investment in West African countries, and happen to be consistent with Dewan and Kraemers' (2000) study. In their abstract, Bollou and Ngwenyama have this expression*: "While the findings demonstrate positive growth in TFP […], TFP growth in the ICT sector has been declining, and these countries are not yet able to take advantage of scale efficiencies. Careful attention must be given to future ICT investment strategies and performance management of existing ICT infrastructure if continued growth is to be achieved"* (p.294).

Apart from the complementary investments that are firm oriented, such as adjustments in business processes, acquisitions, skills development, etc. (Jovanovic & Rousseau, 2005a), socially grounded complementary investments are also important. Learning from the works of Dewan & Kraemer (2000) and Bollou & Ngwenyama (2008), such complementaries can be pegged in education, health, and income generating activities in social settings. The list is further enriched by Hamel (2010) who adds participation and empowerment, which are in turn the dimensions of human development (McGillivray & White, 1993; UNDP, 2010). Further down, the human development dimension sits at the centre of the international development partners' agenda.

This study's constructs on complementary investments, innovation complementaries, and factor productivity growth, are further used to peg the GPT conception of ICT in the developing economies, operationalized through the diffusion processes. The former two are reserved for Chapter Three and its context of discussion of social innovation machinery, while the latter is clarified in the next section.

2.2.2 ICT as a source of output and productivity growth

Evidence from research on the behaviour of GPTs and economic performance strongly supports the idea that GPTs play a catalyst role in the process of economic growth (Dimelis & Papaioannou, 2011). However, researchers and practitioners in ICT are still concerned about some research findings. For instance, in the case of Dimelis and Papaionnou (2011), econometric results have shown that productivity effects of ICT are mainly present in the industries that are either ICT producers, or heavy ICT users (p.38). But in the scenario of Africa's DCs, both the producer and user industries are not so significant. Even in the social setting, there is limited information on the nature of the 'use' to which ICTs are deployed.

The question that follows is, if the stakeholders for ICT diffusion in developed economies (specifically the US and Europe which were included in the Dimelis and Papaioannou (2011) study) are industries, what would their similitude be in the contexts of Africa's DCs? In the spirit of the posed question, this study finds it viable to stress the efforts to setup a platform for SI that can be influential in developing the industries themselves as an intermediate stage.

Studies on the phenomenon of the relationships between ICT, economic performance, and productivity in economies, have followed many approaches. These include: the use of macro-economic data on ICT investment (Becchetti, Bedoya, & Paganetto, 2003; Bollou & Ngwenyama, 2008; Gretton, Gali, & Parham, 2002); the use of industry level data on factor inputs and productivity (Dimelis & Papaioannou, 2011; Gretton et al., 2002) or the assessment of firm level factors in relation to ICT uptake (Becchetti et al., 2003; Pilat, 2004). Another thread has explored the contributions of ICT to productivity from the sectoral regimes of ICT-producing and ICT services-using sectors (Castellacci, 2008; Pilat & Lee, 2001).

In the mix, the results from each approach have richly contributed to the knowledge of understanding how ICTs impact on economic growth and the conditions under which their impacts emerge (OECD, 2004). Specifically, each approach has its own qualities in revealing the factors of interest. For instance, the firm level approaches have been able to reveal firm

specific characteristics, such as firm size, age, capabilities, innovation, competitive effects, organizational factors, and business models (Arora & Gambardella, 2006; Gambardella & McGahan, 2010; Pilat, 2004) as the micro level drivers of uptake and allotment of resources to ICT. In the long-term the firms achieve capital deepening and improved factor productivity.

The use of aggregate data is more revealing of ICTs' impact on total factor and multifactor productivity gains (TFP and MFP respectively) (Pilat & Wölfl, 2004), than it is in showing their impacts on a factor-by-factor basis. For instance, this approach cannot reveal the 'improvement in labour quality' as the source of growth in labour productivity (Gretton et al., 2002; Gretton, Gali, & Parham, 2004; Jalava & Pohjola, 2007, p. 466). Two types of studies conducted in the past provide good evidence of this, namely the studies that focused on the exploration of ICT-production, that is, the production of computers, semiconductors, infrastructure equipment (Pilat & Wolfl, 2004), and software as an equivalent of a primary product (Dayasindhu, 2001); and the studies that focused on ICT-use related impacts. The former manifest that the ICT manufacturing sector contributed significantly to the high rates of productivity growth in the countries where the ICT-producing sector has grown over time and gained a strong importance (Pilat & Lee, 2001). The latter reveal that the ICT services-using sectors have shown significant impacts on productivity growth only for the United States of America and Australian economies, but have not shown any meaningful significance in other OECD countries that were used in the respective study (Pilat & Wölfl, 2004).

In a summarised general observation, ICTs influence economic growth by grossly promoting the output per unit input of factors of production. That is, ICTs act on capital and labour qualitatively. Thus, theorizing human-centred development on development is guaranteed in applied ICTs, fulfilling the need for that development in the community of international development stakeholders (McGillivray & White, 1993; OECD, 2004; UNDP, 2010), and paving a way for human/social focused developmental impacts of ICTs to be viewed in the lenses of prevalent social theories, such as the Sen's capabilities approach. In other words, as GPTs, ICTs can effectively be strategically operationalized to contribute to persons' abilities to function for economic ends. For practical purposes, it is then worthwhile to interrogate the contribution and operationalization of ICT activity for *capabilities*, and for human and non-human *factor productivity*. According to the studies on the impact of ICT on labour productivity, the ICT-related sources of labour productivity growth include: ICT capital

deepening; improvement in labour quality; and general increase in multifactor productivity. These are briefly described below.

Capital deepening is associated with the availability of more capital services per hour worked (Jalava & Pohjola, 2007), or increase in capital per unit of labour as capital investment intensifies on one hand, and capital gets substituted for labour on the other(Gretton et al., 2002).

Improvement in labour quality is applied as the ratio of labour services to hours worked (Jalava & Pohjola 2007), which should improve with the diffusion of ICT. Gretton and colleagues (2002), and Becchetti et al. (2003), demonstrate that labour quality of firms improve as firms hire relatively more skilled and more highly compensated workers, in which case per capita labour cost increases (Cette et al., 2005) with respect to the increase in its quality. The cost increase is compensated for by the increased productivity.

Increase in multifactor productivity: Using firm and industry level data, Gretton and others (2002) confirm that there is strong support for the link between ICT use and MFP growth. The carrying arguments are stated as follows:

> *"ICTs as a general purpose technology enables other productivity-enhancing changes. For example, ICTs could facilitate other actions such as the reorganisation of economic activity between firms and industries, or they could provide an indispensable platform upon which further product or process innovations are based" (Gretton et al., 2004).*

2.2.3 Context and concepts for social innovation

Social transformation is a process realized as an aggregate of change processes in various dimensions of a society, which happen to be taking place over time. ICT in the context of GPT characteristics have great potential for social transformation when they are operationalized optimally. Previous sub-sections have specified the main concepts that drive the diffusion and functionality of GPT for economic development as *complementary investments* and *innovation complementaries*.

Much of the available literature on GPT is contextualized in the world of business organizations, with reference to firms and industries as the carriers of the respective '*innovations'* and '*investments'*. My task in this work is to extend the concepts to social spheres.

The explored literature on GPT is resourceful in providing information on the sources of GPT potentials for socio-economic performance, information on the sectoral effects in the process of diffusion intensification of GPTs, and information on the role played by the dual industry economic structures (Sections 2.3.1& 2.3.2). However, specific to ICT in the context of there being a narrow and shallow industry base in the Africa's DCs (Gibbon, 2001; Page, 2011, 2012), developing a framework for the realization of GPT potentials is a significant challenge. Annual averages of market capitalization of corporate stocks listed on country bourses worldwide (until 2012 as per the available data – see Appendix AA) are used to approximate for the capital investment depths across world economies. For Africa, with the exception of South Africa (at USD 612.3 billion), market capitalization is as low as USD 0.8 billion (Malawi), with the highest at USD 58.0 billion (Egypt) for the last year in the series (2012). By comparison in Europe, the lowest value is USD 158.7 billion (Finland) against highest of USD 3,019.5 billion (UK). The number of stock market listed companies in Africa range between 2 companies (Cameroon) and 88 (Mauritius), with the exceptions of Egypt (833 companies), Nigeria (223 companies) and South Africa (402). The latter three countries display exceptionally high bourse listings compared with the rest on the continent (Appendix AB).

To tackle the challenge of frameworking for GPT potentials, I base this framing on an understanding that human development and economic performance are inter-related. Thus, although targeting human development indices with ICT may be the focus of developmental interventions (Alampay, 2006; Gigler, 2004a; Smith, Spence, & Rashid, 2011), such indices face a danger of ending up leading to short-term incidences. For socio-economic transformational ends, such incidences need to be theoretically and practically enriched for long-term economic performance, as called for by other sources such as Morales-Gómez and Melesse (1998). In my perspective, human development has to translate into long-term economic development and social transformation via quality labour and improved productivity, as the values that ICT as a category of GPT should reinforce.

Literature on social theory inform that a social unit, such as a society, can respond to internally or externally induced changes for short-term, or long-term adaptations (Schoderbek, Schoderbek, & Kefalas, 1990). According to Schoderbek and colleagues, short-term changes are only functional (pertinent to "what you do" (p. 54)). They are not structural, meaning that they do not result in the definitive structural (the "what you are") modifications

of the entities concerned. The long-term response of a unit system may result in a system "structurally modifying itself, or structurally modifying its environment" (Schoderbek et al., 1990, p.54).

In an attempt to focus ICTs to output and productivity versus derived economic growth and social transformation in the Africa's DCs, I have chosen in this study to embark on the inherent characteristics of GPTs for long-term economic and social transformation impacts, using the lenses of social development theories, specifically the *Capability Approach* (CA), to frame SI as a social capability for long term social change in the mediation of ICTs. This is done by positioning SI in the spectrum of ICT diffusion processes, via inferring the innovation complementarities and complementary inputs, as discussed in Section 2.2.1.

The effects of framing for SI are twofold: First, SI is framed to generate a medium that functions as a carrier for investment and innovation complementaries in cases where the industrial base is weak (Page, 2011, 2012); and second, SI is framed to specify the 'agency' of state as the key role player (in the similitude of management in the industry context) for organized and sponsored innovations.

From the reviewed literature on the diffusion processes in the places where ICT have successfully supported economic growth in a phenomenal way, I derive five important conceptions:

2.2.3.1 Side-by-side existence of producer and user industries

The first conception is that the side-by-side existence of producer and user industries have played a vital role in the diffusion processes of ICTs as mutual carriers of secondary innovations on the production and use of primary innovations (Pilat & Wölfl, 2004). In that duality resides the important mutual exchange of value (markets). By interpretation, this signifies the structure of the economic base. The prevalent economic base should be responsive and ready to absorb the innovation; that is, it should have the capability to adapt it for its activity, and have the capability to operationalize it. In the case of Africa's DCs, the status of the economic base is shallow technologically.

In the scenario of Africa's DCs, alternative carriers have thus got to be groomed. Some prospects may be generated by pressing for measures such as state-sponsored innovation systems, for instance national innovation systems (Hanna, 2003). Another option is to adopt subsidized assimilation of ICTs in small and medium enterprises, for instance by providing tax concessions on ICT services, or by basing government and state agencies' services, such

as tax authorities, on electronic networks (Zheng, 2009), etc. Alternatively, mechanisms can be implemented to motivate for small scale industries, especially ICT based industries, to venture into the production of ICT equipment and services. The challenge ahead of these prospects resides in how to align ICT with the existing economic bases which are dominantly agrarian economies (Boserup, 2005; Scoones, 2009).

2.2.3.2 ICT impacts on labour quality and multifactor productivity

The second conception is that ICTs have impacted on economic growth through their influence on labour quality and multifactor productivity. Labour quality is measured as the ratio of labour services to hours worked (Cette et al., 2005), and it improves over time with ICTs deepening, as has been experienced in the countries of Finland, Ireland and Korea (Pilat & Wölfl, 2004). Productivity on other factors of production also improves as an outcome of capital deepening in those factors (Gretton et al., 2004; Jalava & Pohjola, 2007). The main challenge inherent in the scenario is in catalyzing mechanisms for migrating some factors, such as labour and land, from non-commercial subsistence production (Bryceson, 1999, 2009; Kotha, Zheng, & George, 2011) to commercial agriculture and other commercial niches. ICTs have a role to play in this arena with appropriate approaches in place, for instance, having ICTs enshrined in a SI machinery of a nation.

2.2.3.3. Innovation complementaries and complementary investments as mechanisms

The third conception is that innovation complementarities and complementary investments are the strong mechanisms through which major innovations spread in economies, thereby unleashing their economic impacts through economic units. The two facets are described under (A) and (B) below.

(A) Technological innovations are complementary to other innovations (Bollou & Ngwenyama, 2008; Bresnahan & Trajtenberg, 1995; Helpman & Trajtenberg, 1996). Through innovation, economic units can produce new products and processes, or adapt to new technologies, changing markets and modes of competition (Chambers & Conway, 1992; Lawson & Samson, 2001).

Through technological innovations, firms use their core competences as platforms for ICTs. For instance, by 1960 Finland had gained potential competencies in telecommunication (Jalava & Pohjola, 2007). On this platform, the Finish Cable Works had it in its long-term plans to begin to manufacture computers. In 1970 the country began producing commercial computers. For ADCs a lesson is to identify the areas of competence, and use those as the

starting point for venturing into mainstream ICTs. This should be envisioned in major SI machinery, beyond the artefactual or technological innovation interventions for poverty alleviation.

(B) **Complementary investments require resources.** From the macro-economic point of view, Helpman and Trajtenberg (1994) have observed that economic units, such as firms, 'divert' resources to the development of complementary inputs to take advantage of a new innovation in technological deployments. Core competencies, profits and competition drive the motives for resource diversion. Ray (2007) and Castellacci (2008) also observed that an investment in one sector of an economy, has the effect of raising return to investment in other related sectors via inter-sectoral knowledge exchanges and 'vertical linkages'. Similarly, lack of complementary investments can potentially lead to persistent technological inefficiencies of other innovations (Sahay, 2013).

The perception of ICTs as being a fundamental human development tool (Alampay 2006; Morales-Gómez & Melesse 1998), needs clear policies for strategic alignment with other sectors in the society to assure for complementary investments. Thompson and Walsham (2010) highlight public infrastructure; governance, accountability and civil society; entrepreneurship and economic activity; and access to global markets and resources, as the particular dimensions needing strategizing in ICTs for development. Ngwenyama et al. (2006), commenting on the results of their study on the relationship between investments in ICTs, education, health and economic development, indicate that there is a complementary relationship among them.

Investments carried out in economic units have two effects in scope. One is that they create the necessary capacities for the maintenance and sustainability of the innovation in target within the user economic units. The other is that they provide for necessary hard (e.g. physical manipulations) and soft (mental processes) skills input for maximization of returns from the innovation.

In a social settings of Africa's DCs, where firms as economic units are weak and without enough resources to dedicate to investments for new innovations (Ewusi-Mensah, 2012), an economy may fail to take advantage of high-level ICT innovations. Alternative approaches for motivating investments are essential in such cases, and one of these is a coordinated national social innovation systems (Hanna, 2003; Pavitt, 1990; Ray, 2007; Rohman, 2013). In a coordinated system, sectors and their demands play a role in generating the impetus, and

setting the direction for the trajectory of innovations through linkages and knowledge exchange. Again, in the absence of a strong body of firms such as is the case in ADCs, the state can use budgetary allocations to sponsor the innovation processes. In essence, these are macro-level conditions that need a rooted administrative activity.

2.2.3.4 ICT-based missions have short and long term scopes

The fourth conception is that there are short-term and long-term scopes of ICT-based missions. These have different strategic implications for economies and for social transformation (Cette et al., 2005; Morales-Gómez & Melesse, 1998). Short-term missions focus on solving social problems (Avgerou, 2008) or attaining functional gains. Long-term missions should focus on social transformation or structural gains. Such a focus essentially re-defines the forms, functions, process and impacts of ICTs for that expected end-result (Orlikowski, 2008). For instance, in the UNDP proposed vision for development, when ICTs are used for development, they have to "create an enabling environment for people to enjoy long, healthy, and creative lives" (UNDP, 1990, p. 9, as cited in Hamel (2010, p.1).

2.2.3.5 The argument for a social innovation mechanism being necessary for social development and social transformation

At this point, the argument I am making, as a final conceptualization, is derived from the knowledge gained in the literature on the diffusion of GPTs, complementary investments, innovation complementaries in the sectors of an economy, and shared linkages to conceptualize SI and SIM. (The concept of SIM was defined in Section 1.1.10 in Chapter 1). This argument holds that SI is a necessary capability for social development in DCs, and SIMs are one of the social arrangements to influence the delivery of ICT based functionings. This argument can be expanded in more detail as follows:

First, social transformation has to be conceptualized as a long-term social process. More specifically, short-term efforts should aim at developing a collective capacity of a society to innovate, through which capacity a society as a unit can learn, innovate or adapt; and achieve the status of being an 'innovative' society in the similitude of 'innovative firms'.

This is a social innovation capital founded on learning, adaptation and modification, and creativity (Lundvall, 2007; Nelson, 1993). (These variables are later used to assess ICT based practice for prospects for leading to SI capacity in Africa's DCs.)

Second, a working social innovation mechanism (SIM) can be realized as an outcome of a visionary social arrangement, to function in the diffusion processes of ICTs; thus for example, even technology transfer practices can be strategically turned into learning opportunities for cultivated social innovation (Avgerou, 2008; Corea, 2000a). In addition, technology transfer, could also include establishing manufacturing or production avenues for ICTs in the places of destination, in order to provide opportunities for locals to engage in innovation streams.

Third, in the general economic performance target, SI can be comprehended as a 'societal endowment', which can be drawn upon to contemplate the strategies for transforming labour and other factors of production to increase their productivity.

Fourth, in a comparison of the effects of ICTs to economic growth in the US and EU, the studies by Bresnahan, Brynjolfsson, & Hitt (Antonelli, 2003; Bresnahan, Brynjolfsson, & Hitt, 2000) and later on Van Ark, Inklaar & McGuckin (2003) revealed two things in principal. One is that the EU was behind the US in the contribution of ICTs to economic growth. The other is that the US was fast to realize ICT-motivated productivity. The first scenario was explained as being 'due to the increase in the stock of skilled labour' in the US, which results in the facilitation of the use of ICTs. The second was explained as being due to a larger employment share in the ICTs-producing sector and faster productivity growth in services industries that make intensive use of ICTs. The pertinent lessons from this for countries strategizing ICT for development can be considered to be as follows: (1) to use mechanisms such as SIMs to generate 'stocks of 'skilled labour' through enhanced innovativeness; (2) to promote, through SIMs, innovations that raise the share of ICTs in services, or the intensity of use in ICT-based services to foster productivity in those sectors; and (3) to undertake efforts to increase the level of employment in ICT-based industry as this may yield positive results in appropriating the benefits of ICTs.

2.3 Chapter conclusions

In this chapter, the concentration was on the aspects that attend to the first two research sub-questions.

Section 2.1 addressed the question: What are the contemporary conceptualizations of the operational values of ICTs and the applied approach / methodology for addressing digital divide in the context of ICT4D for social transformation for development in ADCs? It was noted that the expected knowledge outcome was to understand the current theoretical and

methodological perceptions on the scope of the impacts of ICTs on socio-economic processes, how these perceptions impact on the diffusion of ICT in DCs, and what the knowledge gap is with respect to ICTs ability to influence social development via 'social innovation'.

The principal argument in this study was presented, namely that the internal and external efforts must work to push ICTs to the core of economic structures and economic relations in the economies of ADCs. In this regard I explored the theoretical, methodological and empirical perspectives for their capacity to ground my argument. I observed in the text that the phenomenon of the digital divide is too narrowly addressed, despite there being theoretical contributions which extend its constructs to cultural and political dimensions of development. I explicated the scope of the operationalization of ICTs as being limited to the areas of promoting 'use of technology', as if this is the only beneficial plane of technology; and as being limited to confronting developmental problems with artefacts. Artefacts were criticized as inappropriate in the whole process of technology diffusion in ADCs, because they are motivated for short-term outcomes, at the same time failing to function for other aspects of development, namely behaviour (in the sense of human-centric innovativeness), ideologies (addressing attitude), and institutions. The section was capped with a discussion on the grounded implications of applied ICTs, which when levelled against the underscored dimensions of ICTs, they were seen to be based in the dimension of enhancing use. The gap is identified as cutting across the theoretical, methodological and empirical fronts. While one dimension of ICTs is being persistently pursued, enhancements for the other two should be considered to facilitate the economic growth and productivity impacts of ICTs.

Section 2.2 addressed the question: Are alternative conceptualizations of the values of ICTs and the thesis on 'social innovation' warranted by the prevailing social development approaches or frameworks (such as the capabilities approach)?

The expected knowledge outcome was stated to be to inform on 'social innovation' in the context of ICT diffusion processes beyond the artefacts worldview. It was argued that the focus on the diffusion processes of technology, is where the development strategists should strive to realize the necessary *innovation complementaries* and *complementary investments* which work to peg ICTs in the bases of African economies. Increasing economic factor productivity and promoting economic growth were seen to be the alternative values of ICTs, which lead to long-term effects of technology.

I used the section to explicate the contextual ingredients of GPTs that relate ICTs to social transformation as being the dual existence of ICT innovations producing and consuming sectors; the generation of economic growth through their influence on labour quality and multifactor productivity; the emergence of innovation complementarities and complementary investments; and the distinction in the approaches meant for short-term and long-term scopes of ICT-based missions. In the discussion I pointed out the challenges ADCs face in facilitating for these ingredients in their economies.

The next chapter uses the provisions of the Capabilities Approach to describe the resource allocating, the communicative, and the coordinative working, of the study's proposed SIM template. This is a hypothetical social arrangement for the projection of long-term-focused technological innovations in Africa's DCs.

CHAPTER THREE: Review of Literature - Working Theory Underpinning and the Conceptual Framework

3.0 Introduction

In exploring the literature to answer the first research sub-question, I worked to uncover the ICT conception gaps that remain un-addressed in the current perspectives surrounding practice in applied ICT for development. The exploration for the second sub-question sought to back-up the thesis' conception of ICT-GPT and SI, the goal being to open-up a space in the agenda of applied ICTs for development in ADCs, that accommodates a focus on the diffusion processes of ICTs beyond the 'use' centred focus.

This chapter (Three) proceeds to the third research sub-question: "How can practice in applied ICTs be aligned with this study's proposed conceptualization of SI and ICT-GPT for the fostering of ICT-backed development in ADCs?".

In the modest valuation of development, development theories are seen to downgrade utilitarian conceptions of development, in favour of efforts that aim at changing the wellbeing of humans holistically. Some social theories refer to the phenomenon as 'expanding capabilities'. Other scholars, such as Steyn (2011), have proposed ICT4D approaches that aim at social up-lifting through the *enlightenment* of individuals, in other words acting on their *cognition* and *psychological* faculties to empower them.

It is perhaps ironic that where efforts in applied ICT4D seek to achieve development of the people, the actions in practice point at them dealing with circumstances. In other words, there seems to be an unfortunate tendency in ICT4D to equate 'social innovations' with 'social needs' (that is, material or felt needs) (Section 1.1.4); and the understanding that drives the motives for action in the name of 'social innovations' in applied ICT, seems to be generated in anticipation of achieving MDGs, poverty alleviation, and social development.

For the purposes of reminding the reader of my stance on this, I reiterate my argument against the conception of social innovation as confronting social ills or needs with innovative tools materially; in favour of social centric development that comprehends social innovation as a social capability for development. Within this declared worldview, my target in the reviewed literature is to contextualize SI within the existing social development theoretical frameworks.

This chapter addresses the states and individuals as the key role players, and the roles they are to play, as being foundational for the indigenously-driven SIM in Africa's DCs. The perspectives of CA are used to conceptualize the constructs in the frames of the phenomenon, and thus guide the development of a conceptual framework for the study.

The rest of the chapter proceeds as follows: Section 3.1 provides the conceptualization of SI in the discourse of development literature in the framework of CA. Section 3.2 provides an elaborate description of the CA, in the context in which it is applied in this study. Section 3.3 looks at the provisions of CA for its extension in various dimensions of knowledge. The section is capped with the application approach to conceptualize SI. Section 3.4 puts forward a conceptual framework for the operationalization of SI in the diffusion of ICTs, and Section 3.5 summarizes the chapter's conclusions.

3.1 Contextualizing SI in the discourse of development literature in the framework of CA

In contemporary academic and research works, well-being and human development focused development theories, such as the CA and Livelihoods frameworks (Scoones, 2009), are broadly used as an alternative to the conventional utilitarian, incomes-, and resources-based theories (Chambers & Conway, 1992; Kuklys & Robeyns, 2005; Nussbaum, 2003; Robeyns, 2005).

The utilitarian approach to development is blamed for four main factors, according to Sen (Nussbaum 2003, p.34). First, it does not account for 'adaptive preferences', where certain classes of people, have adjusted to certain deprivations in order to conform to certain situations. An example is the common practice in some parts of Africa, to practice female genital mutilation; women in those places may not complain about it, although it is a deprivation of a capability to life (sometimes the victims bleed to death), to safe delivery, etc. Second, a utilitarian worldview of development does not account for distributional inequalities, where in some economies there is alarming poverty of people amidst great opulence. This leads to the third condemnation of the utilitarian worldview, that it has a tendency of biasing development in favour of the status quo. The final criticism of the utilitarian approach is that it suggests that development is a 'state' or condition of a person, such as a state of satisfaction. Expressed more concisely, the utilitarian conception of development is not sensitive to the actual living conditions of the persons in communities, on a one-by-one basis, which renders it not suitable to guide wellbeing intended interventions.

By the same token, to enhance 'social innovation' in social contexts and the content it has to carry, the construct must be emancipated from the 'addressing needs' driving understanding, to gain the understanding that aims at equipping persons with capabilities to address their needs; this is human-centric development. According to Sen, development is the expansion of capabilities, and the enhancement of freedom to individuals to choose the functionings they wish to operationalize for the living of their will (Sen, 1999, 1999). The 'capabilities' understanding is an advanced conceptual framework for human development that has already been put to a variety of applications in different fields of studies.

Extensive literature exists on the 'capabilities' framework, and I need to be specific as to how I apply it in this text. Thus I first present the description of the framework in its classic acronym - the 'Capabilities approach' (CA) in the next section; and then proceed to underpin my notion of SI within it, in the subsequent subsections.

3.2 The description of the Capabilities Approach

There are two versions of CA: Sen's and Nussbaum's versions (Sen, 1980; Nussbaum, 1999, p. xiii; 2003; Robeyns, 2005, p.103). Sen's CA is organized around motivating for human freedoms of choice to functionings by eliminating impeding factors (Sen 1980, 1999, 2005). Nussbaum's version extends the original CA by specifying the 'basic human capabilities' which, according to Nussbaum (2001, 2003), contribute to the normative conception of social justice in its context. Both the Sen and Nussbaum versions of CA focus on social change and justice, with a strong foundation in the earlier works of philosophers Adam Smith, Karl Max, Immanuel Kant and Aristotle (Sen 1984, 1999, Nussbaum 1999, 2001, 2003). The two versions are separately discussed below.

3.2.1 Sen's version of the Capabilities Approach

The Capabilities Approach is an approach based on a view of living as a combination of various 'doings' and 'beings'. It is founded on the recognition of being and content of being. It notes that the classical economics conception of welfare is focused on goods, exchange, and satisfaction, regardless of who is entitled, thus using income and expressed satisfaction as the measure of development. As an alternative to that, CA looks at the entitlements which define what a person is able to do, and to be, and the liberty available to that person to choose what to do and be.

Entitlements refer to the "bundles of commodities over any of which a person can establish command, by using the rules of acquirement that govern his circumstances" (Sen, 1997, p.30). Accordingly, development in CA is viewed in the sense of 'extending freedoms' of persons, contrary to the evaluation of goods and services in a market setting and utility (Gasper 2002).

In the statement of CA, Sen uses the concept of 'capabilities' to express what a person as an agent is able to do, or the potentials available to her/him; in other words, "the alternative combinations of functionings that an individual can achieve, and from which that individual can choose for any desired end" (Sen, 1993, p.271). In the sense of Sen's (1993) CA, 'freedom' is the expression of a person's capability set. Accordingly, Sen uses the term 'functionings' to conceptualize the various things that a person manages to do or be in leading a life (Sen, 1993). The concept of 'choice' is coined by the author to recognise the place of *concerns* and *values* of a person in decision making on the relevant functionings to that person. The freedom to lead different types of life is reflected in the person's set of capabilities, including personal characteristics or endowments such as talents, and social arrangements (Sen, 1999). Social arrangements are responsible for the realm or context in which persons act, for example the articulation of entitlements.

In CA, Sen's promoted conception of development is organized around treating humanity as an end, not just a means for economic prosperity ends (Sen, 1999). The idea is pegged on the argument, according to empirical evidences, that countries may have high economic prosperity on the basis of personal income or GDP measurements, yet display low achievements in the quality of life of their people. In Sen's worldview, development is a process related to the expanding of real freedoms that people enjoy (Sen, 1999). The CA informed literature expresses development as being about the existence of the freedom of choice of functionings in the personal, social, economic and political spheres of lives of persons (Klein, 2009; Robeyns, 2005). This freedom is capabilities dependent (Kleine, 2009; Kuklys & Robeyns, 2005; Nussbaum, 2001). A person with a good armoury of capabilities can choose to operationalize a subset of them at will, and as it may require, for any desired end value (See Figure 3-1).

According to Sen, functionings include the various beings a person may value, such as being adequately nourished, being healthy, escaping morbidity and mortality, or being able to take part in the life of a community (Kleine, 2009; Oosterlaken, 2009; Robeyns, 2005; Zheng & Stahl, 2012).

In the other words, 'functionings' is a term used to conceptualize the person's state of 'being' and 'doing', which encompass the actions and conditions that a person 'has reason to value'. Thus, capabilities refer to all states of being and doing potentially available to a person as provisioned by her freedom space, while 'functionings' are subsets of capabilities (Sundararajan, 2000; Zheng & Stahl, 2010). Functionings are further described as constitutive of a person's being, and evaluation dimensions of a person's well-being (Sen, 1999, p.44).

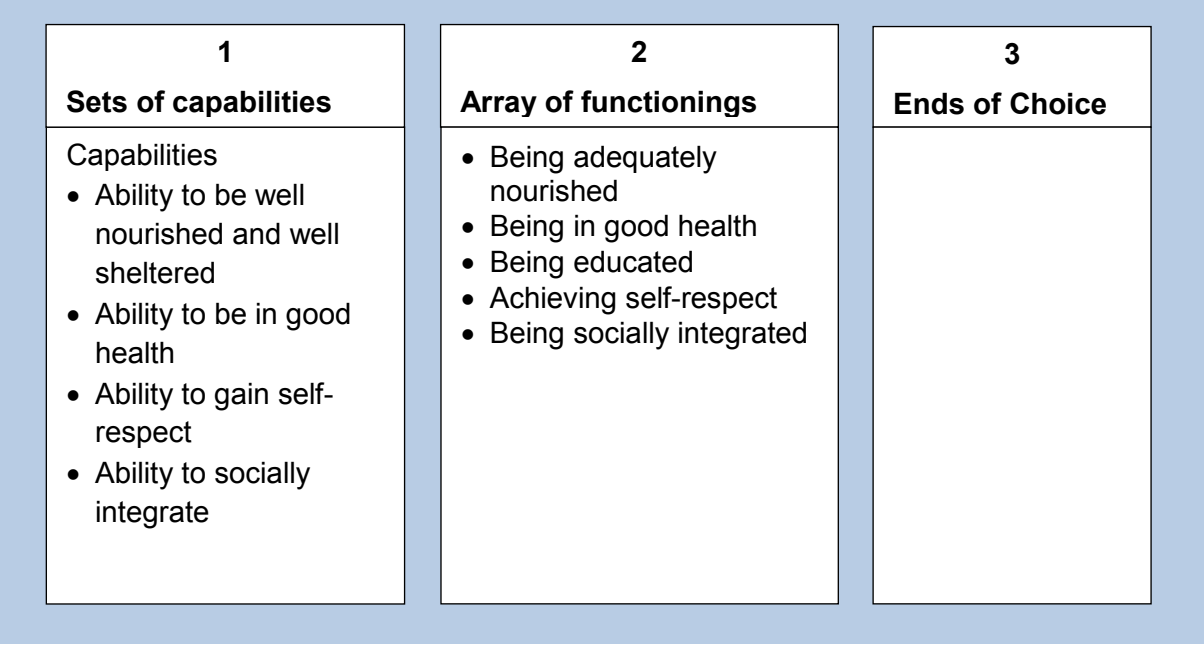


Figure 3 - 1 Sens Capabilities Framework

The other side of the coin is deprivation of capabilities. A limited capability is a limit on the possible functionings or achievements available to a person, which in turn render the person vulnerable to circumstances, and dependent on chance to survive. This is at the root of un-development and poverty.

In the CA framework, the growth in GDP, personal income, technology, and capital investment, are perceived as means to expanding freedoms enjoyed by members of a respective society (Sen, 1999). Based on the conception of freedom as capabilities, individual agency is central to addressing social deprivations. Individuals are not free if they are hungry, ill, illiterate, or homeless (Knopf, 2000). Development, therefore, is enshrined in the removal of various types of 'un-freedoms' that leave people with little choice and little opportunity for exercising their reasoned agencies. According to Sundarajan (2000), these include poverty, tyranny, poor economic opportunities, neglect of public facilities, and intolerance among other things.

Next is a description of the Nussbaum's version of CA.

3.2.2 Nussbaum's version of Capabilities Approach

According to Sen, capability sets may differ from individual to individual or society to society, and according to purpose. For operational purposes such as policy construction, capability sets should be specified according to purpose and context (Sen, 1999, 2005; Robeyns, 2005; Klein, 2009). Thus, Sen stops at the philosophical level without stating the actual capabilities to be practically operationalized, except for some stated to demonstrate the understanding of the concept, such as the ability to be well nourished and well sheltered, the ability to be in good health, the ability to gain self-respect, and the ability to socially integrate (Figure 3-1).

Nussbaum (2003) is of the opinion that capabilities can help in the construction of "normative conceptions", for instance "of social justice with critical potential for gender issues", only if a definite set of capabilities are stated as the most important ones to protect. Nussbaum's version stresses that, although Sen's CA "provides the best basis for thinking about the goals of development…(it) has to be willing to make claims about fundamental entitlements" (Nussbaum, 2003, pp.33-34). Nussbaum's version is hinged on the claim on capabilities as the fundamental entitlements of the humane, and should be constitutionally provided for in all societies as a social justice. For that matter, Nussbaum claims that there are central human capabilities that should be incorporated in all constitutions, which are specified as: life; bodily health; bodily integrity; senses, imagination and thought; emotions; practical reason; affiliation; other species; play; and control over one's environment (both, political and material) (Nussbaum 1999, 2003). Their corresponding descriptions (quoting from Nussbaum, 2003, pp.41-42) appear in Table 3-1.

Table 3 - 1 Nussbaum's Version of CA (An Excerpt from Nussbaum (2003, pp.41&42)

Capability	Description
1. Life.	Being able to live to the end of a human life of normal length; not dying prematurely, or before one's life is so reduced as to be not worth living.
2. Bodily Health.	Being able to have good health, including reproductive health; to be adequately nourished; to have adequate shelter.

Capability	Description
3. Bodily Integrity.	Being able to move freely from place to place; to be secure against violent assault, including sexual assault and domestic violence; having opportunities for sexual satisfaction and for choice in matters of reproduction.
4. Senses, Imagination, and Thought.	Being able to use the senses, to imagine, think, and reason – and to do these things in a ‘‘truly human’’ way, a way informed and cultivated by an adequate education, including, but by no means limited to, literacy and basic mathematical and scientific training. Being able to use imagination and thought in connection with experiencing and producing works and events of one’s own choice, religious, literary, musical, and so forth. Being able to use one’s mind in ways protected by guarantees of freedom of expression with respect to both political and artistic speech, and freedom of religious exercise. Being able to have pleasurable experiences and to avoid non-beneficial pain.
5. Emotions.	Being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger. Not having one’s emotional development blighted by fear and anxiety. (Supporting this capability means supporting forms of human association that can be shown to be crucial in their development.)
6. Practical Reason.	Being able to form a conception of the good and to engage in critical reflection about the planning of one’s life. (This entails protection for the liberty of conscience and religious observance.)
7. Affiliation.	(A) Being able to live with and toward others, to recognize and show concern for other human beings, to engage in various forms of social interaction; to be able to imagine the situation of another. (Protecting this capability means protecting institutions that constitute and nourish such forms of affiliation, and also protecting the freedom of assembly and political speech.)
	(B) Having the social bases of self-respect and non-humiliation; being able to be treated as a dignified being whose worth is equal to that of others. This entails provisions of non-discrimination on the basis of race, sex, sexual orientation, ethnicity, caste, religion, national origin.
8. Other Species.	Being able to live with concern for and in relation to animals, plants, and the world of nature.
9. Play.	Being able to laugh, to play, to enjoy recreational activities.
10. Control Over One’s Environment.	(A) Political. Being able to participate effectively in political choices that govern one’s life; having the right of political participation, protections of free speech and association.

Capability	Description
	(B) Material. Being able to hold property (both land and movable goods), and having property rights on an equal basis with others; having the right to seek employment on an equal basis with others; having the freedom from unwarranted search and seizure. In work, being able to work as a human being, exercising practical reason, and entering into meaningful relationships of mutual recognition with other workers.

Two lessons can be learned from Nussbaum's list. First is that in the articulation of capabilities, one needs to be able to identify the organizing domains. These form the headers of the list in Nussbaum's case. The second lesson is about populating the headers with the appropriate attributes. Nussbaum's list is essentially informed by human rights and social justice. The basic idea, Nusbaum states, is the conception of the "*dignity of the human being"* and *"a life that is worthy of that dignity*" (Nussbaum 2003, p.41). Thus, Nussbaum's list is a stipulation of the capabilities described as central requirements of '*a life with dignity'*.

CA has been applied to a variety of conceptions in a variety of disciplines since its coinage, such as in development studies, welfare economics, social policy, and political philosophy (Nussbaum, 2003; Robeyns, 2005; Zheng & Walsham, 2008). It also has been applied in diverse ways to rationalize regional philosophies (Nussbaum, 2003), to rationalize design (Oosterlaken, 2009), or to conceptualise practice (Alkire, 2005; Zheng, 2009; Zheng & Stahl, 2012).

Having presented the two versions, general functional observations of CA can be made in the following section.

3.2.3 Observations on CA

While Sen uses the approach of removing or eliminating impeding factors to human freedoms of choice to functionings, Nussbaum specifies certain capabilities as rights which that person needs to be provisioned for.

In my observation, the two approaches can be combined by conceptualizing the persons' freedoms as a space, whose dimensions are unlimited; with politics, relations, institutions, natural events, etc., acting to either enhance or put a limit to how far and in which direction a person can go in exploiting her set of capabilities in it.

CA is acknowledged to assume a philosophical capacity in that it is accepted as being "primarily and mainly a framework of thought, a mode of thinking about normative issues, thence a paradigm that can be used for wide range of evaluative purposes" (Robeys, 2005, p.109). CA is also acknowledged as a 'fully universal model' grounded in the perspective of holding it important for each and every individual, in each and every nation to be treated as an end (Nussbaum, 2001). This principle of each person as an end is relevant in building an all-inclusive information society envisaged in the WSIS 2003 declarations (ITU, 2005). Thus, CA is considered useful in evaluating policies, interventions, and practice according to their impacts on humanity, as opposed to the utilitarian approach.

3.3 Provisions for the application of CA

Scholars have exploited the CA's flexibility for the specification of capabilities according to the context of application (Sen 1999; Nussbaum 2001, Klein 2009), by normatively applying the approach in a variety of fields. In Sen's words, "the format of *doings* and *beings* permits additional *achievements* to be defined and included….according to relevance and context" (Sen, 1990, 1999a). The statement is a philosophical provision for the application of CA in the contemplation of individual well-being, social development, and the necessary political, policy, social arrangements, etc. A further provision entails the allowance for choice of focus, where Sen points it out that one can choose a focus in relation to the "….underlying social concerns, values, and motivation of the exercise at hand" (Sen, 1990).

In his works, *"Capability and Well-being",* Sen (1993) has advised that applying CA to a person's advantage really involves evaluating the persons' actual ability to achieve various *valuable functionings* as a part of living. If extended to social advantages, the author suggests that sets of 'indispensable' individual capabilities can be used for aggregate appraisal, as well as for the choice of institutions and policy.

A good number of works have used the CA approach to contextualize it the field of ICT. Among the aspects the approach has been used for include: evaluative works (Hatakka & De, 2011; Hatakka & Lagsten, 2012); theoretical extensions (Zheng & Stahl, 2012); and conceptual operationalization (Kleine, 2009, 2011).

I am selectively interested in Kleine's works, namely: "ICT4WHAT? *Using the choice framework to operationalize the capability approach to development"* (Klein, 2010); and "*The Capability approach and the 'medium of choice': steps towards conceptualizing information and communication technologies for developmen*t" (Kleine, 2011), because the

two are closely related to this study's operationalization of CA to conceptualize my notion of SI. I will give a brief description of Kleine's (2009) approach in the next section before I proceed to conceptualizing SI.

3.3.1 Application of CA to conceptualize ICT4D: Kleine's approach

In the field of ICT, Klein (2009) is known to have applied CA to rationalize the impacts of ICT in the intra-process conceptualization of development. Klein applies the concept of choice to construct the "Choice Framework" (Klein, 2009, p.110). This is then used to demonstrate the usefulness of ICT in the *empowerment of people to choices*, and in the policy implications in making ICT accessible before that empowerment can occur. Klein has also specified a set of resources and two bases for them, which include the person or 'agency-based' resources, and the circumstantial or 'structure-based' resources (Klein, 2009). Social arrangements (Sen, 1999) fall in the second category (Figure 3-2). The two types of resources, according to Sen (1997), work as capability inputs for agency capabilities, and they complement each other (Sen 1999). Sen's conceptualization of inputs to capabilities is illustrated in Figure 3-2.

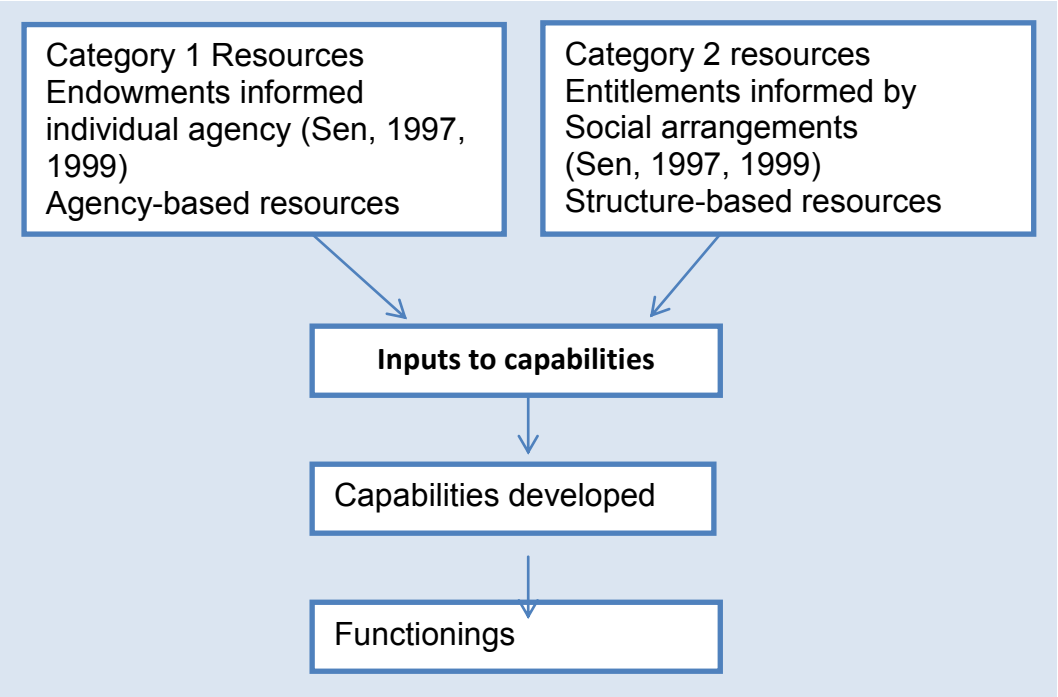


Figure 3 - 2 Sen's Conceptualization of Inputs to Capabilities

In the views of this study, it is for the countries that need to command ICT innovatively to set-up social arrangements. In such arrangements, the states as agents of individuals, that is, '*the agency of the state*' (Burnet, 1967), will act to articulate resources for innovation

activity. For instance, provisions for material and financial resources can be financed through taxes to individuals or firms, to pursue technological innovative missions. In the long-run, complementary investments and innovation complementaries, necessary for the pro-productivity diffusion of ICT-GPT, may be realized. In this study, the stipulated kind of arrangement is shortened into the term, 'social innovation machinery' – SIM (Section 1.1.4).

Capabilities are classified as end and means of livelihood. Livelihood is defined according to Chambers and Conway (1992, p.5) as "..means of gaining a living", or well-being (Chambers & Conway, 1992). According to Scoones (2009), this includes sorts of economic activities. Equally, SI may be conceptualised as a means to long-term social transformation; this is a situation where everybody in the society enjoys life of choice, it is a means to sustain diffusion of technology, and it is an end of a society's innovations. This allows the long-term structural transformation of societies as social systems (Section 2.4).

3.3.2 Application of CA to conceptualize my notion of Social Innovation

Drawing from the observations on CA (Section 3.2.3), within the boundaries of a freedom space of a person, there can be defined different combinations of capability sets which may be activated for functionings according to *concerns* and *values* of a society. However, in the lenses used by Nussbaum (2003) to construct for basic '*human capabilities'*; and Kleine (2009) to construct for the sets of *resources* for *using ICT to empower people to make choices*, I deduce that desired capabilities must be enhanced by extending the boundaries of freedoms. The means to this are varied depending on the nature and form of the boundaries. Where the boundaries are imposed by politics, cultural circumstances, or social oppression for instance, people may fight. Where the boundaries are imposed by the environment, like in malaria infested places, people confront the environment innovatively; and where the boundaries are imposed by time limits, people work harder, and so on.

CA is applicable for individual as well as social ends, depending on the level at which the *concerns* and *values* are stated, though there is not much research or conceptual work existing that is done at the social level. Sen's CA has a provision for social analysis stated as thus:

> *"In the context of some types of social analysis, for example in dealing with extreme poverty we may be able to state a small number of centrally important functionings and the corresponding basic capabilities e.g. ability to be well nourished and well sheltered, capability of escaping avoidable morbidity and pre-mature mortality etc." (Sen, 1993, p.272).*

In this text, SI is framed as a social end, and my goal is to operationalize CA to rationalize for SI in the very processes at the base of social development: namely, the diffusion of ICT-GPT. In this context, the first question to ask is: *How can SI contribute to the capabilities of agents to improve on their functionings, directly or indirectly, and at what level – as a component to capabilities or another array of functionings?* Next but not far from the first is, *How can SI add value to the freedom of people to choose how they like to live?* Since SI cannot be a state of any agent which is a characteristic of functionings, it can only enhance other functionings, such as being knowledgeable, healthy, technology savvy, etc.

It is within the paradigm of interpretive epistemology that I propose conceptualising SI along the lines of enhancing a society to generate innovations that widen the functionings available to its social agents. Nussbaum's No. 4 stated capability of "Senses, Imagination, and Thought" (Table 3-1) could be able to accommodate the concept of SI, but the description thereof falls short of clauses providing for the advancement of innovations of a social interest type nature. From the lessons learned in the aftermath of Nussbaum's list, technology is not in the background of informing the list drawing exercise. It is easy to see the notions of "religious", "artistic", "musical" but not technological innovations. In this case the relevance of Sen's openness on the specification of capabilities according to context can be resorted to for similar exercises.

For a start, I benchmark using Nussbaum's approach to listing of central human capabilities (Table 3-1), by advancing two enhancing questions: (1) Can SI be stated as a central social capability?; and (2) Can a society propagate itself without innovativeness? These two questions are used to inform the framing of capabilities in the collectivity of persons. Thus, focusing on a social context, I underscore *concerns* and *values* in the collective perspectives of an organized society. In turn, these are used to determine the *choices* over collectively organized functionings, such as coordinated innovations, or coordinated social arrangements for innovation. To illustrate, think of community programmes for child immunization or campaigns against HIV in various countries of Africa. The notional SI capability I am proposing is framed in Figure 3-3.

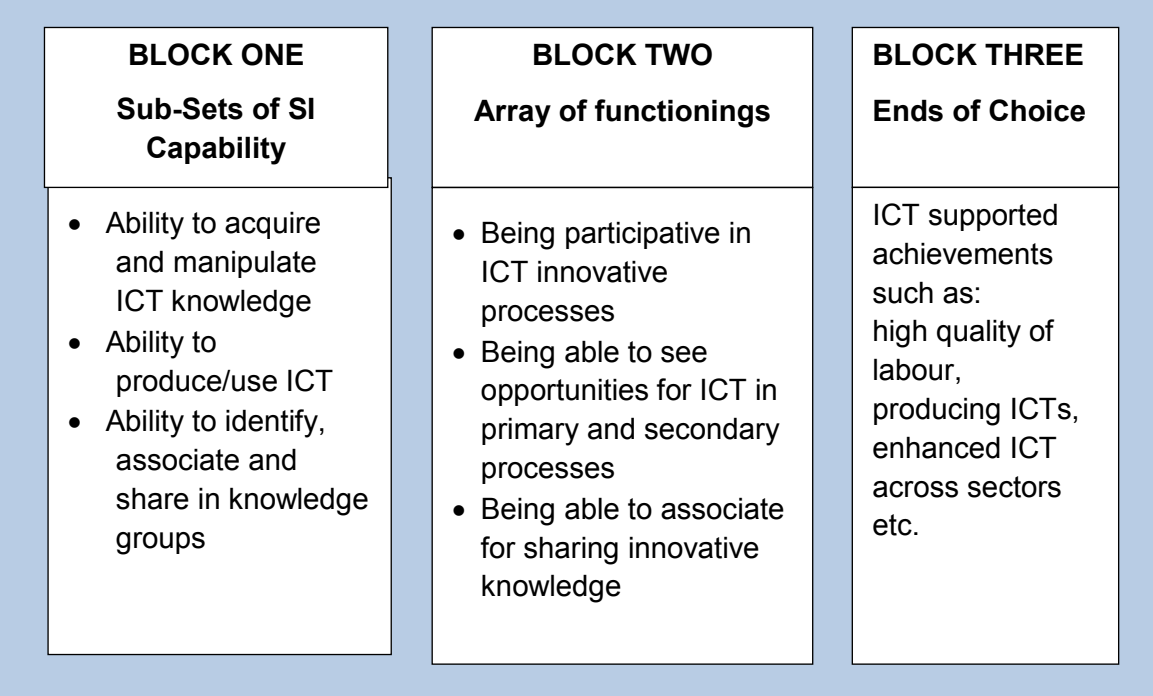


Figure 3 - 3 Framing of the SI Capability

In Figure 3-3, the first block is designated as holding sub-sets of the SI capability. These depict the capability-making abilities. The way they are articulated stimulates thoughts as to what might be prerequisite inputs to the capability. For instance, to be able to acquire and manipulate ICT knowledge, there must be inputs, such as education and vocational training institutions. To be able to associate and share knowledge there must be facilities for association, and facilities for sharing such as group platforms. The list is only indicative and in no way exhaustive. In short, in the background of capabilities are the inputs, which Sen (1993) and Klein (2009) present as assets. The element of inputs to capabilities forms the basis for the conception of social arrangements (Section 1.1.4). In the framework of the proposed SI inputs to capabilities, is a reflection on the composition of the SIM as it appears in the conceptual framework presented in subsequent sections. The inputs include, for example, articulation of resource guarantees to support innovation processes; articulation on the establishment of specialized institutions such as technology incubator, R&D; articulation on the person's entitlements in the processes of innovations, and so on.

The second block is a depiction of the possible functionings supported by the SI capability and its subsets. The functionings can be conceptualized as the range of attainable choices in the guarantees of the capability.

The third block shows the technological achievements. Achievements can be collectively discerned, or even realized at an individual level. Innovative opportunities for a society widen the capability base, and the base extends the opportunity range in a to and fro mechanism over time.

Having conceptualized my notion of SI in the capabilities framework, I turn to fitting the construct within the broad conceptual framework of the study. This is done in the next section.

3.4 Conceptual framework: The operational perspectives of SI in the diffusion process of ICT-GPT

The world of ICT, in which all societies actively engage in the production of innovations and development of ICT solutions, requires the presence of an environment in which the players can freely appropriate their innovative capabilities for different functionings of their choice. Where this freedom is lacking, the scholarship of CA specifies the concerned players as being in the state of deprivation (Section 3.2). Such a state is unfavourable in the ICT dichotomy of the privileged and unprivileged, or the digital divide. The unprivileged tends to be persistently suppressed to vulnerability to the advancements in technology itself, and to the community of developers' economies. In the former case, the advancements tend to widen the gap in the achieved technology know-how and the yet to be known. In the latter case, the disadvantaged societies have no opportunities to enact their own structures in technology (Castellacci, 2008; Castells, 1999), thus remaining susceptible to foreign structures and the negatives of globalization.

I argued in Section 2.1, that a different attitude towards developing countries is necessary, in which the respective country societies should be perceived as potential innovators in ICTs. In such a case, the community of practice and localized agency should strive to cultivate the necessary capabilities. I suggest that the states in DCs could play an active role to enhance the environmental and social endowment factors of societies. The reason is that these are essential for the realization of SI platforms that are capable of unravelling the developmental impacts of the GPT functionings of ICTs in the economies of DCs. This stance forms the foundation for the conceptual framework I am developing hereafter.

In the development of the conceptual framework, I embarked on an investigation of the scholarship of ICT-GPT and the constructs of *innovation complementaries* and *complementary investments* in Chapter Two (Section 2.2.1). The *structural modification* of

economic bases are the pillars for social transformation for social development in Africa's DCs. (The essence of the economic base factor is further elaborated on and consolidated in Chapter Seven under the 'dimensions of change'.)

Using the lenses of CA, targeting for development is worked better by focusing on enabling people to function as they will, for the life gains of their choice (Sen 1999, Klein 2009, Oosterlaken 2009, Robeyn 2005). This means, the value of any interventions for development that is added, emanates in their contributing to people or society's portfolio of capabilities. This is where SI is pegged as a societal capability: in the collective functionings of communities for holistic social transformation. Functionings of a society can be specified in collective perspectives of gaining certain recognitions, such as 'an innovative society', 'an advanced society in software development', 'an advanced society in applied electronics', etc; and in the examples of Finland (mobile technology) , India (software industry), and Japan (automobile technology), and so on. Thus societal innovation capability is supposed to enhance technological functionings of a society.

The argument in this section is about focusing ICT to output and productivity as a foundation for economic growth and social transformation (Figure 3-3), promoting SIM as the social arrangement, while SI is conceptualized as a societal capability informed by the CA framework. With an appropriate SIM in place, various functionings should be achieved with ICTs in their broad definition of GPT characteristics. ADCs are technologically deprived and vulnerable. This is manifested by their persistence in the state of being 'primarily users of ICT', with a very low level of participation in the creation or ICT development mainstream (Carmody, 2009). This is seen in ADCs' predominantly 'user' or 'receptor' status (Carmody, 2009; Rohman, 2013). ADCs remain markets for ICT, which means they cannot avoid paying for the continuously added features in, say, mobile phone software or computer operating systems, which in many cases have no applications in the day-to-day lives of people in different localities. In the cases where the developer's support to some applications is terminated, developing countries are left with no option but to pay for extra upgrades, quite un-necessarily. On the other hand, being dominantly users, ADCs are limited in the ICT-based functionings for lack of capacity to do so. The current 'push' for use of innovations, or emphasis on artefacts exhibited in literature (Bankole et al., 2013; Chigona & Licker, 2008; Ochara et al., 2008) is not, under normal circumstances, accompanied by exposure of core knowledge on those innovations. Such knowledge is not the component of focus in the diffusion process.

Under such circumstances, this study suggests deliberate approaches to enhancing SI as a collective (social) capability, so that societies can be able to participate in the drive of technological advances. In his works, Sen's submission singles out economic opportunities, political freedoms, social facilities, transparency guarantees, and protective security as crucially instrumental freedoms for social change (Alkire, 2005; Sen, 1999).The *individual agency* and *social arrangements* are held to be intensely complementary to each other, as individuals exploit their freedoms within the influences of social commitments. Passerine and Wu (2008) prescribe political, institutional and legal arrangements as being capable of moderating the realization and access to opportunities or social capabilities. The access will then promote equality and quality of life. In turn, social capabilities are principally enhanced by human capital (based on learning and health) (McDonald & Roberts, 2002), social capital (marked as relationships), natural capital (physical resources), and produced capital (knowledge enriched products).

In the context of Sen and Passerine & Wu's constructs on social arrangements, it is noted that social arrangements play a role of advancing to social players the freedom to access opportunities. This study's proposed SIM is organized around the same premises of being a setting through which the 'agency' of individuals can avail freedoms to identify the opportunities in ICT-GPT. Through their freedoms, the agents achieve functionings. In aggregation, the achievements may reflect in improved factor productivity and contribution to social and economic well-being or social development.

Figure 3.2 presents the comprehension of SI in the broad picture of ICT-GPT diffusion for socio-economic development. The numbered steps in the descriptions are described further in the text. For reasons of space utilization, this process begins before the figure is presented.

Block 1 (Innovation) depicts the emergence of an innovation. Two sources of innovation are possible: an external source and an internal source. When the innovation originates externally, the host economy must have capabilities to integrate the innovation in its socio-economic structures (i.e., must have *integrative or adaptive capabilities*). When the origination of innovation comes from within, the host economy must have capabilities to apply the innovation for different functionings (i.e., must have *functional capabilities*). This reflects the necessary conditions in the host economic base.

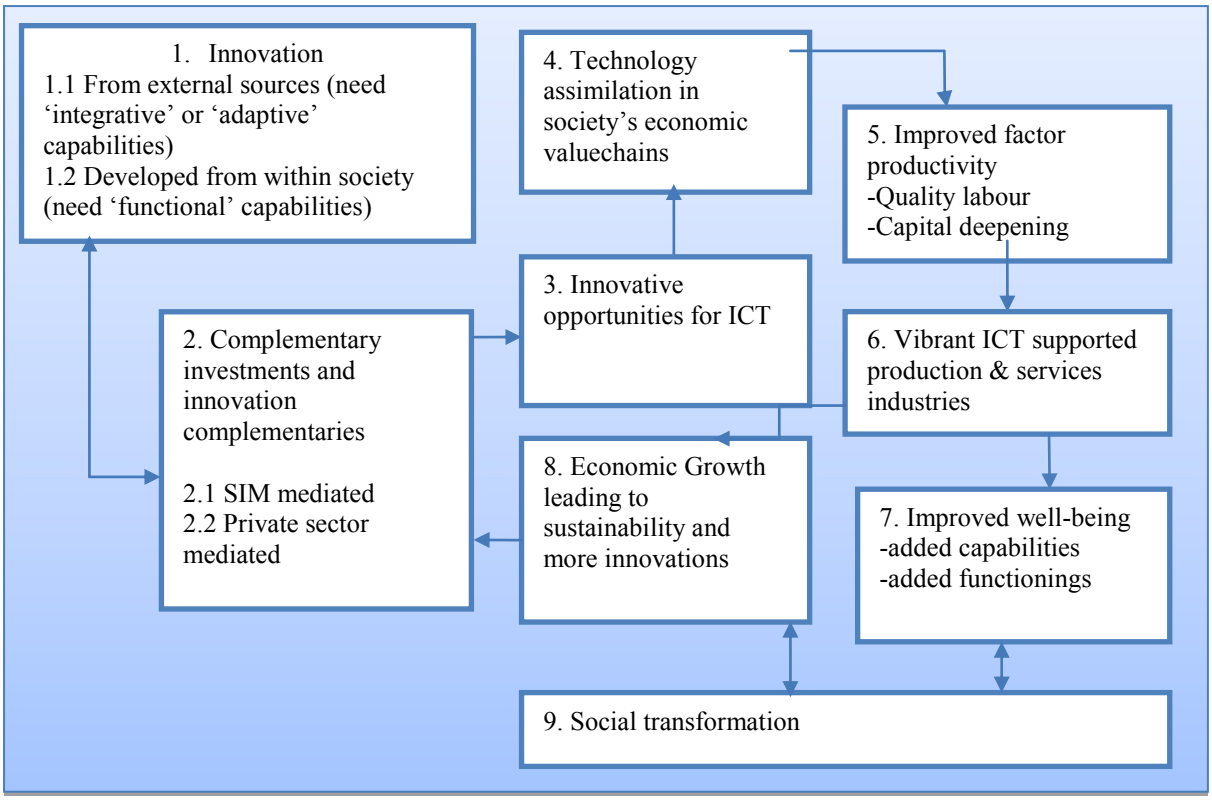


Figure 3 - 4 Modelling for Long-term SIM Mediated Technology Diffusion

In the diagram, **Block 2 (SIM mediated Innovation complementaries, complementary inputs and sectoral linkages)** depicts the necessary factors for the diffusion of the innovation (of Block 1). These are the State, and the Private sector, who play the role of providing resources. Under the current situation in Africa's DCs, the local body of industrial players lacks the financial and human resources capacity to commit to investment outlays for re-engineering of processes to absorb new innovations, or training, for example. In such circumstances, social arrangements such as the SIM, should serve to avail resources to potential spaces of action via state budgetary allocations, or state guarantees. Where financially strong firms exist (which includes the foreign direct investments (FDI)), the SIM should provide space for unilateral action or PPP arrangements to foster a beneficial diffusion of innovations.

Block 3 (Innovative opportunities for ICT) depicts the outcome of Block 2. Through the pervasiveness characteristic of GPTs (Section 2.2.1), innovative opportunities may be realized in other areas apart from the specific place where the innovation originated. This should pave a way for the deployment of ICT for productivity ends, even for the externally originated artefact-centric innovations.

Block 4 (Technology assimilation), depicts that in the process of the discovery and innovative use of ICT opportunities, technology spreads in an economy, and leads to technology assimilation. This is the process through which technology intensification - a necessary component for factor productivity, takes place. At this stage, the majority of economic processes are comprehended in the enhancement of the technology. For example, a flower garden may be set up with a computerised irrigation system, computer-controlled quality may be included in the processing of the flowers for export, etc,

Block 5 (Improved factor productivity) is the outcome of technology assimilation in the economic processes of a society. It is a long-term impact of technology, achievable through the strategized diffusion process of ICT-GPT. This is what this study is advocating that the agency of the state in ADCs should drive and invest for.

Block 6 (Vibrant ICT supported production and services industries) reflects that in the long-term, ICT products and ICT-supported products and services, should emerge and contribute to GDP.

Block 7 depicts **Improved well-being**. As a result of vibrant ICT-supported industries, industrial capacities improve in a number of aspects; the economy becomes vibrant; and this leads to improved well-being; quality labour improves yielding more output per unit input of labour time, in turn leading to people getting better rewarded, etc.

Block 8 depicts **Economic growth** through which more social capabilities for the building-up and maximizing of human capital, social capital, natural capital, and produced capital (McDonald & Roberts, 2002; Passerini & Wu, 2008) become achievable and sustainable.

Finally **Block 9** indicates the resultant **Social transformation** into a transformed society, that is thriving economically and socially.

This then describes the envisaged model of long-term SIM mediated technology diffusion process.

It is evident that SIM bears four values, viewed in the lenses of CA (Alkire, 2005; Sen, 1999):

(1) SIM has potential to provide for the effective organization of social assets, such as tax revenue, into resources to support innovation diffusion.

(2) SIM should act as a policy corridor for social innovation: It is in the framework of the SIM that necessary institutions should be structured; and visionary policies reflecting the future expectations of the society should be enshrined in contemporary missions with respect to how ICT be framed.

(3) SIM should provide for the inaction of protective security clauses, in the form of protection against risk, in the cases of venture capital directed to ICT.

(4) SIM has the advantage of being naturally social inclusive, and yielding benefits for the entire society, thus side-lining the complained about problems associated with economic prosperity that results without improvement in the quality of life of individuals (Kuklys & Robeyns, 2005; Sen, 1990). Important in the machinery is the mechanisms through which it should be established. For instance, it should not have arrangements that implicitly or explicitly favour the economically strong firms, as in such cases the impacts will be dominantly attached to those firms, side-lining the majority poor. In the end no social transformation would happen as desired.

3.5 Conclusions

In this chapter, the discussion was focused on answering the third research sub-question, which aimed at investigating the mechanisms through which practice in applied ICTs will be aligned with the study's hypothetical conceptions of SI and ICT-GPT in the diffusion processes of technology. In turn, the aligned setting should allow for a broad front to address the digital divide in ADCs, and lead to ICT-backed development in ADC economies.

In Section 3.1, I briefly presented the theoretical worldview of development in the contemporary community of development stakeholders and noted that the dominant contemporary view in practice appears to favour a social focus viewed from a utilitarian perception of development. This paved a way for the social processes view of social innovations against addressing needs to be discussed within the lenses of CA.

I proceeded to describe the CA in considerable detail in Section 3.2, exposing both Sen's and Nussbaum's versions of CA. I ended by expressing my observation that essentially, capability sets for different functionings reside in the freedom space of persons or societies. The quest for enhancement of any capability set means a demand for extending the boundaries of the freedom space. The means and form of efforts used, or requested, to extend the freedom space depends on the actual or anticipated factors acting to limit the respective boundaries.

I then looked at the provisions that CA has provided to allow for its application in academic and research work. I found that the approach's operationalizing variables include concern and values, which can be defined at any level and for any purpose, thus warranting its use in a variety of spheres, and even in the social sphere of technology and innovations. I proceeded to demonstrate the application of the approach to conceptualize my notion of SI in a social setting.

Finally, I framed a conceptual framework in Section 3.4 which positions the conceptions of SI and ICT-GPT in the logic of the study graphically. In the framework, I emphasized that long-term productivity growth impact needs to be the focus of diffusion processes of ICTs. It was indicated in the framework that the states in ADCs have an opportunity to take an active role in the diffusion process of ICT-GPT, in order to ply it into locally defined desirable ends such as contribution to social development via productivity. I drafted a 'SIM' as the social arrangement necessary to provide a mechanism for SI as a societal capability.

This chapter concludes the literature review part of the study. The subsequent chapters will look into the empirical aspects of the study. The empirical phase is expected to project a picture of the perceptual frames in the community of practice, and how the frames affect the adopted approaches in ICT4D, as well as the diffusion process of ICTs in ADC economies. The empirical phase is also expected to shed light on the possible elements of practice which could be utilized by the agency of the states on behalf of their countries, to enhance long-term factor productivity growth and ultimately also social development. The outcomes of the this chapter should supplement the development of the theory in Chapter Seven.

CHAPTER FOUR: Methodology

4.0 Introduction

The extensive review of literature presented in chapters two and three, served to explore the first three research sub-questions (of Section 1.6), and to consolidate theoretical knowledge on both perceptions of the digital divide, as well as the methodological inadequacies that might exist in applied ICTs' ability to address the digital gap in ADCs. In addition, the chapters generated an understanding of different perspectives on implementations for addressing the digital divide in broad terms, using the lenses of CA. Chapter Three concluded with a theoretical conceptual framework for modelling long-term, SIM mediated, technology diffusion (illustrated in Figure 3-4). The constructs deriving from the conceptual framework are used later in Chapter Five to develop the dimensions used for empirical observations related to, the key role players in generating initiatives for applied ICTs for development in ADCs; the focus of practice; and the theoretical motivations in the background of practice; as well as the potentials in practice to foster the necessary innovation complementaries and the opportunities for pervasiveness of ICT.

In this chapter (Four) the methodology that will be used for the empirical exploration of the research questions will be explained; in other words, how knowledge was empirically constructed will be described. In its scope, Chapter Four encompasses the study design; the followed epistemology and ontology; and the approach to data collection, making observations; and developing interpretations.

The rest of the chapter proceeds as follows. Section 4.1 describes the research paradigm and the basic guiding philosophy for knowledge creation and interpretation, i.e. the ontology and epistemology. Section 4.2 underpins the interpretative scheme within the scholarship of hermeneutics. The section details the strategy used for maintaining validity and justification of the knowledge that is developed through interpretations. Section 4.3 provides the research design and a methodology for data sampling, collection and analysis. The content analysis methodology that was used in the capturing of thematic contents is also outlined in this section. The chapter is wound up with a concluding remark in Section 4.4.

4.1 Research ontology and epistemological position

In approaching empirical enquiry, the one important thing to be made clear beforehand is the study's ontological and epistemology positions. Ontology is about the belief world of the

study, while epistemology describes how the process of knowledge seeking is conducted. These two concepts will be briefly described, before declaring the study's adopted positions.

4.1.1 Ontology

According to Hirschheim (1985) and Mingers (2004), there are two known ontological positions in scientific studies, namely 'realism' and 'relativism'. Realism believes that "the universe is comprised of objectively given, immutable objects and structures" (Hirschheim, 1985, p.3) which exist independent of human beings. *Relativism* believes in the subjectivity of objects to the existence of human beings. The objects in this belief are *socialized* (Sewchurran, 2010).

In the paradigm of relativism, "*reality* is a subjective construction of mind", and as such, "*reality* varies with different languages and cultures" (Hirschheim, 1985, p.3). As much as '*reality* is mediated through our lived experience' (Husserl, 1927), the same is "also mediated through the specific culture, historical time, and language in which we are situated" (Heidegger (1981) as cited in Sandberg, 2005, p.45). According to Lee (1994), *social reality* is a construction of the 'ephemeral' daily human interactions. Lee (1994) further explains that as the social reality acquires 'realitiness', it also acquires influential powers to the individuals in an intertwined relationship with it, to the extent that the contextual individuals acquire contractual agency to propagate it through its contracted meanings of instances in it. At this juncture, it is the social members who justify the validity of the interpretive knowledge constructs, through the comparison panel of the constructs versus the common life-world contractual meanings. This is in the accordance with Lopez and Willis (2004) who argue that "for the description of the lived experience to be considered to be scientific, commonalities in the experience of the participants must be identified, so that a generalizable description is possible" (Lopez & Willis, 2004, p.728).

In expounding on beliefs of *realism* and *relativism*, Mingers (2004) concluded that it is from two blocks of '*empiricism*' (to address issues in *realism*) and '*idealism*' (to address issues in *relativism* or *experienced world)* that researchers interact with the world. While empiricism interrogates phenomena through experiments, relativism interrogates phenomena through the experiences of the subjects in it. In empiricism, the results of the research experiments rely on "how best the experimenters align their experiments with the *causal laws*" (Mingers, 2004, p.92). For idealism, the qualities of results rely on the *trueness* of the interpretations of the subjects' actions (Sandberg, 2005).

The actions of social subjects in *'idealism'* can be observed in the real-time, or in the real-time representatives. The latter refers to objects such as 'texts', which provide social researchers with an opportunity to appropriate the values of empirics, either for the appreciation or challenging of certain social phenomena with alternatives. According to Alvesson and Deetz (2000), the issue at the hands of enquiry in social science is not to "get it right, but to challenge guiding assumptions, fixed meanings and relations, and to re-open the formative capacity of human beings in relation to others and the world" (p.107).

For social issues, the discipline of Information Systems allows one to make a choice on the ontology to follow, based on the prevailing interests of enquiry in the study concerned (Sandberg, 2005). This is the scholarship of the '*paradigmal pluralism'* literature (Landry & Banville, 1992).

4.1.2 Epistemology

In a nutshell, epistemology is about the cognition domain through which we gain knowledge in particular ways. Scholars put it as 'how we acquire knowledge' (Hirschheim, 1985); 'how we know what we know' (Iraba & Venter, 2010); 'the study of what can be counted as knowledge, where knowledge is located, and how knowledge increases' (Cunningham & Fitzgerald, 1996); 'criteria for constructing and evaluating knowledge' (Orlikowski & Baroudi, 1991); or simply the 'theory of knowledge'. In its broad sense, epistemology is an expression of the theoretical perspective that one uses to make sense of the subject matter under investigation (Fossey, Harvey, McDermott, & Davidson, 2002).

In general terms, there are three commonly known epistemological classifications, namely the *positivist, interpretivist, and critical* (Cunningham & Fitzgerald, 1996; Orlikowski & Baroudi, 1991; Stahl, 2008; Thagard, 1980; Walsham, 2012). For lack of space, I limit myself to this mention, and leave detailed descriptions to the original cited sources. Authorities such as Walsham (2012), Stahl (2008), and others in the discipline of Information Systems, advocate for methodological openness in Information Systems research amidst the existence of a diversity of epistemological classifications. The aim is to enrich understanding in the discipline, and to provide the field with capabilities to achieve a 'better world with ICTs' (Walsham, 2012). In the other words, any of the *positivist, interpretivist, and critical* methods can be deployed according to context, bearing in mind that "they are not mutually exclusive and do not constitute all possible choices" (Stahl, 2008, p.162).

4.1.3 Positioning of the study

This is a study pursuing issues of social interest. Its agenda relates to the digital divide, social innovation, and technology uptake – all of which are constructs in a social phenomenon. The purpose of this study's empirical work is to investigate practice for the purpose of identifying the perspectives and content, along the dimensions of the conceptual framework developed in Section 3.4 on the platform of SI for modelling for long-term, SIM mediated, technology diffusion.

Social Innovation (SI) is a mechanism through which the social agents in any society develop means to tackle their environment for development. This is a construct that pins SI to *social reality* as a social phenomenon inherent in the peoples' struggles against their environment. Therefore, the ICT-related actions and interventions for SI in societies should find their meaning, purposes, and value within the *social world* perspectives, as is also argued by Mingers (2004). In this particular study, the global information systems community is conceptualised as the '*social realm*' within which the constructs on SI for social development are being conceived.

It is upon the above-mentioned description of the nature of the issues, and purpose of the empirical component of the study, that this study can be said to follow an ontology of relativism, and can be said to be informed by an interpretivist epistemology. The process of enquiry used in the study is progressed through the principles of hermeneutics (Lopez & Willis, 2004; Sandberg, 2005; Schuster, 2013; Soeffner, 2004).

Having specified the study's underlying ontological assumptions, epistemological paradigm, and the social world of reference, what is required next is to establish the interpretive process involving the handling of the actual empirical materials and establishment of the validity criteria as a norm for social interpretive studies. I will first explore the background to the concept of interpretation.

4.2 Establishing the interpretive scheme for the study

Interpretation is about developing *insight / enlightenment* or an understanding of the situation (Howcroft & Trauth, 2005; Myers & Klein, 2011; Zheng & Stahl, 2011). This could be achieved using literature reviews, discourse analysis, and/or empirical analysis. The essence is that insight involves understanding the 'meanings in life-worlds', whereas interpretations

that generate such meaning exist, according to Soeffner (2004), "in relation to a given socio-historical context of meaning" (p.97).

The meaning people ascribe to the objects in certain instances is an outcome of the intentional character of consciousness; and it constitutes the meaning of reality that appears to them in their experience. In general terms, this is referred to as intentionality (Sandberg; 2005). Intentionality is underpinned in Sandberg (2005) as the basic epistemological assumption that underlies interpretive processes. Accordingly, a researcher is assumed to be intentionally related to the 'research object' in any particular research project.

In the interpretive research programs, such as the one at hand, the 'social reality' world is substituted for the 'objective' world; and that "knowledge is constituted through lived experience of reality" as opposed to "objectivist epistemology", according to Sandberg (2005, p.44). For this study however, the opportunity to gain lived experience of reality is not open to the researcher, so the alternative is to use representations in the form of text and artefacts. As a result, in this study the text materials that were available as the real-time representatives of the provider community in applied ICTs, are used.

According to Sandberg (2005), conducting an interpretive enquiry is a phenomenological practice with stages defining its progression. First is the stage of establishing the observatory frame, determining the subjects of enquiry and deliberating on the empirical materials to be used. The next stage involves the establishment of the interrogation scheme, which means establishing how to interrogate data in a '*sense-making'* way. This involves making valid interpretations, or eliciting 'truth' claims that constitute knowledge. The last stage is assuring for knowledge justification based on the fact that the meaning of, say a text, is dependent on context ,such as a specific discipline of reference, object, or society (Sandberg, 2005). This is similarly reflected in Phillips (2013) who claims that there are no absolute interpretive (or hermeneutic) values.

The described scenario above makes it crucial for a researcher to clearly describe the interpretive process he or she goes through – this is the task of the next sub-section. This is described for communicative purposes, and for purposes of supporting the justification of the deliverables of an interpretation activity.

4.2.1 The hermeneutic approach utilized in the interpretative process of the study

At the base of an interpretation scheme are the philosophical foundations that guide the activity. In the process of conducting an interpretation, the practitioner strives to achieve an

alignment between the philosophical foundations and the methodological processes the study uses to draw its findings (Geanellos, 2000).

The philosophical foundations for this study draw from three aspects: (1) the assumptions I made regarding the narrow definition of digital divide (Section 1.3.5), which limit the scope to implementations in applied ICTs; (2) the assumptions made on the methodological based gaps, that lead to artefacts that are abstracted from the socio-economic reality of ADCs (Section 2.1.5); and (3) the assumptions that are made on the theoretical and empirical based gaps that tend to extend the digital innovation divide (Section 1.3.5) between communities and technology itself, as complex technological innovations continue to take place in the block of origination. These three drawn aspects, with their declared assumptions, provide an impetus to investigate and interpret the world of practice for perceptual realities, and their impacts on the diffusion processes of ICTs.

To remind the reader, the SI phenomenon is the proposition to cultivate for long-term transformational outcomes in the diffusion process of ICT-GPT, which is itself a social process. As a desired end, social transformation should be an outcome of socially collective efforts and vision, and a social construction of reality, existing contemporaneously with people, context and other contextual activities - such as economic or political activities. This is beyond regarding SI objectively, it is relating it with artefacts or addressing social needs.

The other side of the coin is the methodological processes involved. This is focused on deciphering meaning and understanding of the actions and behaviour of social actors in the theoretical and practical planes of the SI phenomenon. Involved are: (1) the context at the global level of information systems community, where the ideas on ICT and interventive projects get conceived. This is labelled as the context of origination; and (2) the context in which the *lived experiences* of SI are realizable. This is labelled as the context of diffusion or receiving block, used interchangeably. Figure 4 -1 illustrates the integrated longitudinal interpretive context.

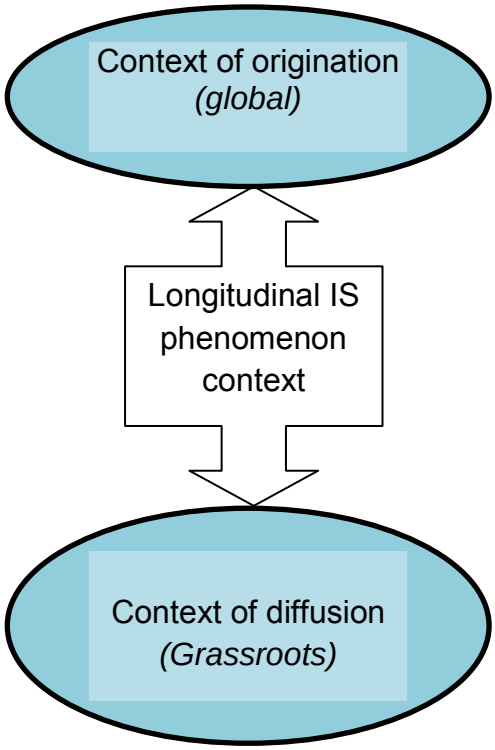


Figure 4 - 1 Integrated Longitudinal Interpretive Context

The first context, the *context of origination*, is to be regarded as a sub-context of the main Information Society phenomenon interpretive context. The source of information in this context is 'text' only. The minds of this sub-contexts' subjects or players can only be captured through their expressions in texts.

In the *context of diffusion,* the source of information is experienced outcomes or the *lived experiences* of the ICT interventions such as social, political or economic gains. The source of information for this context is empirical literature, or record materials on the impacts of any past interventions (for addressing the digital divide and technology uptake in the context of this study's scope).

Through the outcomes in the latter context (of diffusion), the study's aim was to establish the interpretive links between expressed conceptions in the former context (of orgination), the actual outcomes, and the proposed focusing of practice for long-term impacts of ICT-GPT.

The longitudinal SI phenomenon is presented as the referential social world context, which guarantees for *meta-analysis* of data, as, the held conceptualization of the intended impact of any designed intervention should be maintained as a globally held value. For example, if an

intervention intends to provide for 'access to ICT', then 'access' is the value not defined according to place but to a functional meaning.

The type of the resource empirical materials used in this study, the text, calls for the use of the scholarship of hermeneutics as the most viable approach to use in its interpretive scheme. Lee (1994) defines 'hermeneutics' as "the study of interpretation, specifically the process of coming to understand a text" (p.148). As such it is the theory of text interpretation, including wisdom literature and philosophical texts. Butler (1998) defines hermeneutics as "the theory or philosophy of the interpretation of meaning" (p.286) in search for understanding. Gadamer (2008) illustrates further that, the sought understanding does not end at the text level, but rather, the insights and truth are sought. In the argument of Lee (1994), interpretive research includes a phenomenon of subjective understanding based on the conception that "people create and attach their own meanings to the world around them (the 'life-world' or 'social reality'), and to the behaviour that they manifest in their world" (p.148).

In adopting the hermeneutic approach, the study's hermeneutic process proceeds both in relation to the study's motivated SIM intervention of ICT-GPT in the receiving block, and in relation to the motivating expectations of the professional community in the broad society. The study's motivated SIM is informed by the reviewed literature, the CA, and the plotted conceptual framework (of Section 3.4). The held notions in the professional block are solicited from text materials associated with that block's activity, and the knowing about that textual interpretation 'is about uncovering the linkages between text and context' (Prasad & Mir, 2002). It is 'the work of thought which consists in deciphering the hidden meaning in apparent meaning, in unfolding the levels of meaning implied in the literal meaning' (Ricoeur, 2005).

4.2.2 The Hermeneutic Process in the Meta-Analysis

According to Tsuda (1984), "a whole of literature is a set of sentences. *It follows that, (*emphasis added), the pre-understanding (*vorverständnis*) of a whole is necessary in order to understand each individual sentence"; and that is, according to Tsuda, "the basis of hermeneutics" (Tsuda, 1984, p.243). In the other words, a researcher must first develop an experience about the whole – through, for example, accumulating knowledge about it, before the study of its parts can be meaningfully conducted. Schuster (2013) expresses the same idea when asserting that "experiencing precedes analysis and understanding" (p.196). In other

words, a meaning assigned to an object under investigation, can be a product of interpretation, with a specific meaning corresponding to the relation with a whole.

This is a phenomenon that is also described as the 'hermeneutic cycle', which signifies the relation between the element (*holon*) and the whole (*holos*) (Tsuda, 1984). Debesay, Nåden, and Slettebø, (2008) account for the hermeneutic circle as follows: "Understanding is achieved by our interpreting within a circular process, in which we move from a whole to the individual parts and from the individual parts to the whole through the hermeneutic circle" (p.58). The procession of the circular process involved in the interpretations of 'individual parts' (the text material themes, conceptual framework themes, and the research questions themes) and the whole (the Information Systems community's perspectives on digital divide, social innovations, and diffusion of ICTs for instance) is illustrated schematicically in Figure 4-2, and described here.

Figure 4-2 is used to demonstrate how the hermeneutic circle is accomplished in the interpretive process. At the foundational level, the 'elements' and the 'whole' are related in that the elements draw from the whole' (**Phase 0** - natural phenomenon).

The hermeneutic process runs through the following four phases:

1. **Phase One**: the extraction of elements from the observatory plane (micro level);
2. **Phase Two**: the analysis and consultation of the whole, for interpretation of driving themes in empirical materials that represent the worldview of the broad information systems community, (macro-level);
3. **Phase Three:** construction and refining of meaning on the basis of the 'whole', reference to the elements, and the guiding philosophical foundations; and
4. **Phase Four**: presentation of meaning.

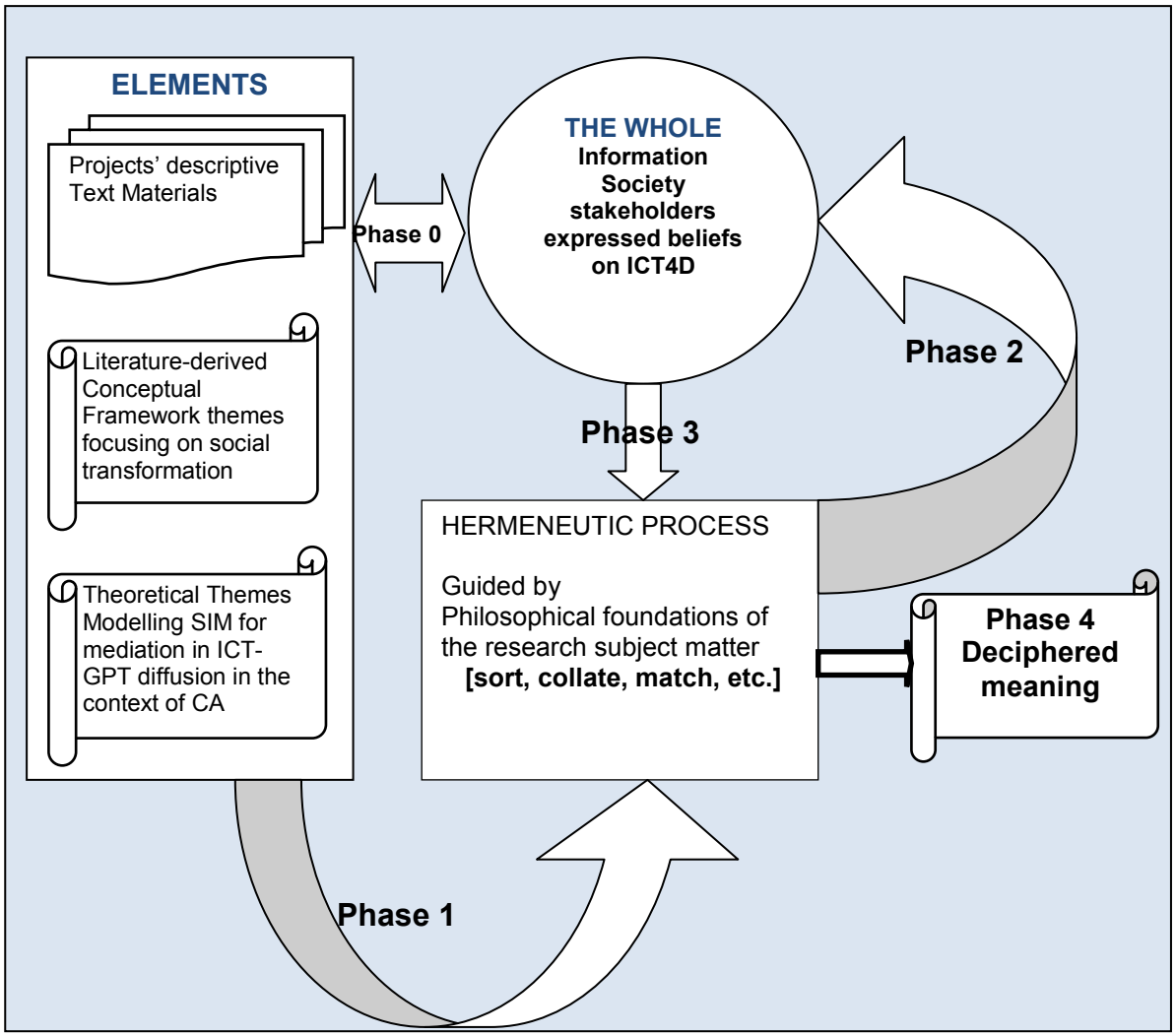


Figure 4 - 2 A Schematic Depiction of the Applied Interpretative Scheme in the Meta-Analysis

The content analysis technique was used to extract the themes from hundreds of individual project descriptive texts according to the research questions (Section 1.6) and the conceptual framework guiding the study (Section 3.4).

The interpretation of the text materials was mediated by the philosophical foundations expressed in Section 4.2.1.

Table 4-1 outlines the matrix of the themes used for the hermeneutic process.

Table 4 - 1 A Matrix of Themes for Hermeneutic Process

Constructs in the community of ICT stakeholders	Constructs in the Study's proposed worldview	Constructs in the long term social transformation worldview
Context of origination – Information Society world view	SIM - Implications of practice to capabilities for SI and SIM as a necessary social arrangement in the mediation of ICT-GPT diffusion	Conceptual framework of long-term implications of practice

The outcome of the interpretive processes is the derived understanding. According to Debesay and colleagues (2008), "understanding takes place when a '*fusion of horizons'* of past and present occurs" (p.58); by which is meant the horizon of the researcher's experiences and pre-conception of the phenomenon under study (the present), and the horizon of meaning of the text materials (the past). Subsequently, the result is the opinion that transcends the two horizons, to which the subjects in the 'interpretative community' (such as the Information Systems social world in this study) may render their discussion.

Prasad and Mir (2002) have pointed out that an interpretive exercise should maintain three features in principal. First, the interpretive exercise should *maintain the* '*hermeneutic circle'* which informs the understanding of the parts of the text in relation to the whole, and the whole of the text in relation to its parts (Geanellos, 2000). According to Prasad and Mir (2002), the interpretation of a text has to be undertaken such that the text itself is fully situated in its context of relevance. In this study, the operationalization of this concept has been achieved by defining the 'Information Systems social world' as the study's context of relevance. This is the context in which ICT projects and other efforts for the deployment of technology for social development are conceived. The same is conceived as the 'interpretive community' (Lopez & Willis, 2004), which has the function of balancing interpretations. More about this concept is presented in Section 4.2.4 which discusses establishing validity of knowledge in interpretive programs.

Second, the interpretive exercise should involve the '*recognition of hermeneutic horizons'*. The text and the interpreter are embedded in two different 'historic-cultural contexts', thus

the interpreter is assumed to be arguing only a certain view of the text and context (Prasad & Mir, 2002). Similarly, the interpreter and participant (the text developer) are assumed to have a different background of "assumptions, ideas, meanings and life experiences" (Lopez & Willis, 2004, p.730). Within this background of different horizons of experiences, the meanings that the researcher and participant arrive at are a function of the focus of the study which eliminates other possible meanings. This is labelled by Gadamer (2008) as the '*fusion of horizons*'.

Third, the interpretive exercise should involve *acknowledging the possible presence of more meaning than what the author of a text intended*. This means that the interpretation should strive to address all aspects of the text, including possible biases (Prasad & Mir, 2002, p.97).

Having now presented the framework within which the interpretation takes place, the question remains how to ensure for validity in the process of making the interpretations, so that the outcome of knowledge constructs are acceptable to the intended audience. This is the issue I deal with in the next section.

4.2.3 Criteria for Justifying Knowledge

Validity and *reliability* are two requirements of empirical works that must be maintained for the generated knowledge to be considered justifiable. For the research programs established on 'objective reality' (i.e. positivist studies), the two qualities are based on the replicability and convergence of research results. However, this does not work the same way for interpretive programs.

The interpretivist school of thought argues that making interpretations is a process driven along the internal subjective qualities of an interpreter (Sewchurran 2010), and are thus not free from the subjectivity of the practitioners. Thus, achieving objective knowledge and truth with respect to the subjects involved in an observation, needs careful consideration. Sandberg (2005) has extensively discussed the issue of knowledge justification in interpretive programs, and suggests that validity and reliability in interpretive programs are guaranteed through 'demonstrated controls' of the researcher's subjectivity throughout the research process (Sandberg, 2005). Specifically, the scholar has identified two control factors for subjectivity, namely '*interpretive awareness*' and '*intentional fulfilment*'.

According to Sandberg (2005), interpretive researchers need to be aware of the influence "their particular disciplinary, theoretical, and methodological perspectives have on the interpretations they make" (p. 59), which the writer refers to as "*interpretive awareness*".

Sandberg suggests that to achieve *interpretive awareness,* researchers have to withhold personal judgements until they have exploited all the evidences available. The ways to achieve this practice include: 1) the researcher being attentive and open to possible variations and complexities of lived experiences; 2) the researcher orienting toward describing what constitutes the experience under investigation, rather than attempting to explain why it appears as it does; and 3) "*horizontalization*", in other words, the researcher treating all aspects of the lived experience as equal from the initial stage.

Derived from the construct of *'intentionality'*, the construct of '*intentional fulfilment*' also constitutes truth achievement (Farber & Husserl, 1943; Sandberg, 2005). For intentional fulfilment to be achieved, the researcher must strive to seek the agreement between the "researcher's initial interpretation" (Sandberg, 2005, p.59) of the object under enquiry, and the meaning given in the lived experience. For example, if we set the perspectives drawn in literature about an object as the initial plane of understanding, then similar conceptual reflections should be expected to emerge through interpretations of empirical materials. Accordingly, Sandberg (2005) (referring to the scholarship of Heidegger), suggests that a researcher has to first seek to gain an understanding of the object under study, which is referred to as the 'initial interpretation of the lived experience' (Sandberg, 2005). It is from this understanding that the researcher will then be able to establish an interpretation of the lived experience with respect to the subjects as individuals, or as a group (Butler, 1998).

In this study, efforts were made to not peg interpretations to any theory in advance, in order to maximize reliability. It is admitted however, that making 'neutral interpretations' may not be possible because: If the hermeneutic cycle is to be maintained, that is interplaying between the whole and the parts for eliciting meaning, then the interpretation of the parts depends on the whole (Figure 4-2). It is through the whole that agreements or contradictions to it can be identified as it manifests in the parts. In reality, the conceptualization of the whole has the tendency of driving the interpreter's formulation of the interpretive frame. It is part of validity and reliability assurance therefore; to make a thorough literature review about the subject matter under study before any interpretation of the parts, in this case the text materials, can be made. I specifically strived for this in the current study. The effect of the extensive literature review is to develop a strong base for the understanding of the whole, which in turn provides a basis for the identification of empirical themes.

Having declared that I was aware of the possible influences I might subjectively have on the outcome of the interpretation exercise, and that I endeavoured to maintain for the controls for validity and reliability, I will move on to describe the design of the study in the next section.

4.3 Research design

This study has a qualitative research design. It is focussed on interrogating the perceptual implications of technological interventions in the enhancement of technology-driven social development in ADCs. The lenses of Sen's CA are deployed to promote a social innovation capabilities and functionings focus of applied ICTs, and the operationalization of a proposed notion of SIM social arrangements. The services of hermeneutic interpretative principles were deployed in the exercise, to link practice to theoretical constructs in the study. The sub-sections that follow will describe the handling of the sources of information.

4.3.1 Data sources specification and data collection methods

The deployed method of observation was to explore text data material on a range of ICT-related projects implemented in developing countries in the period between 2003 (which was the year the WSIS made its declarations to address digital divide with an eye on enhancing ICTs driven development in DCs), and 2014. The materials were purposefully selected from two databases: 1) the ITU-WSIS stocktaking database; and 2) the IDRC databases. According to the ITU-WSIS and IDRC websites, these two databases are the main repositories of ICT deployment initiatives globally.

WSIS Stocktaking is a public database maintained by ITU. According to ITU, the database is a publicly accessible system providing information on ICT-related initiatives and projects with reference to the eleven WSIS Action Lines (WSIS, 2003) outlined in Appendix F. The database was launched in 2004, and by 2013 it contained 3,300 projects according to the ITU website (as accessed on 2nd Feb. 2015). Briefly, ITU was founded in Paris in 1865 as the International Telegraph Union according to its website. It changed the name to International Telecommunication Union in 1934, and became a specialized agency of the United Nations in 1947, covering the whole of the ICT sector from digital broadcasting to the Internet, and from mobile technologies to 3D TV. The main task of the agency is to 'create a digital opportunity platform' for the world's people; this is asserted in its statement that: "ITU is committed to connecting the entire world's people – wherever they live and whatever their means" (ITU website, viewed on the 5th August. 2014).

It is also stated on the website that ITU was founded on the principle of International cooperation between governments (member states) and the private sector (that includes associates and members from industry, international and regional organizations and academia).

In the foreword to the World Information Society Report (2007), the Secretary-General of ITU, Dr. Hamadoun Touré, and the Secretary-General of the United Nations Conference on Trade and Development (UNCTAD), Dr. Supachai Panitchpakdi, jointly expressed the essence of the stakeholder partnership in saying: *"...it is only by drawing upon the resources of a range of different stakeholders that we can build an inclusive, people-centered and development-oriented Information Society, that can accommodate the needs of all participants"* (World Information Society Report, 2007). ITU is currently reported to have a membership of 193 countries and over 700 private-sector entities and academic institutions.

On the other hand, the International Development Research Centre (IDRC) plays a considerable role in fostering ICT on the continent of Africa, according to its 'Brief history' (IDRC, 2010). IDRC is a Canadian organization formed in 1970 with a purpose *"...to initiate, encourage, support, and conduct research into the problems of the developing regions of the world and into the means of applying and adapting scientific, technical, and other knowledge to the economic and social advancement of those regions*" (IDRC, 2010, p.5). IDRC is among the first organizations to recognize the role of ICTs in human development and poverty reduction initiatives. According to its documentary, IDRC is said to be a leading institution and key contributor to the growth of the ICT for development field. IDRC has established a database for its "MINISIS-based" project information system known as IDRIS. The database has a global coverage of data on applied ICT.

The WSIS and IDRC databases are aimed at enhancing the services of ICTs to the marginalized, deprived and vulnerable communities in the underdeveloped world (in the lenses of CA). Although UNESCO, UNDP, and NEPAD have been mentioned in ITU's forums as the main stakeholders in applied ICT, there are no significant online materials to help in the conceptual analysis involving the implementation of ICTs as it is for the WSIS and IDRS sources.

Fundamentally, these two database sources were selected based on their global coverage geographically, and their richness in terms of content on practical interventions for addressing the digital divide. Most importantly, these databases provide a register of activities

carried out by governments, international organizations, the private sector, civil society and other entities. The utilized databases store descriptive narratives of ICT-based projects; the places where they were implemented, or are being implemented; the deploying argent; and what the projects entail. On this basis, conceptual foundations can be assembled. The assumption this study makes on these text materials is that the projects' descriptives carry the core value meaning of the project in the perception of the agents propagating them (projects), who in turn represent the context of origination (Section 4.2.1).

In anticipation of the content limitation, which is that the people who wrote the project narratives could not be located to provide detailed clarification on, for instance, what they meant when they used certain coinages etc., this study sought to compensate for this limitation by conducting a broad scan of the documents available in the stipulated databases.

The captured documents were scanned for the themes determined *a-priori* in literature to be fundamental for the understanding and functioning of SI in social development. The value and relevance of these databases for use as sources of data is twofold: first, they harbour the thoughts of the intervening agents on the face value; and second, they provide a capture point for the philosophy at the centre of the practices. It is assumed that they thus hold the collective agreement of the deciding and supporting parties (the participant stakeholders).

4.3.2 Data collection process

The approach for data collection was through rounds of identifying units for sampling, collecting, analysing, and references for reporting (White and Marsh, 2006). At the apex are 'sampling units' which provide a reference for the population identification. Below sampling units are data collection units and units of analysis. Data collection units serve as units in which variables were measured, while units of analysis form a basis for reporting analyses (White and Marsh, 2006).

4.3.3 Sampling units

Ideally, the sampling frame is comprised of a set of documentaries on applied ICT in social innovation based projects, and the instances of technological intervention that have taken place across Africa. The sampling units include the WSIS projects stocktaking and the IDRC databases as the sole major repository of projects.

4.3.4 Sampling method

The appropriate data for empirical processes were determined on the basis of the scope of the study, which is limited to African developing countries. Purposeful sampling method was applied to exclude data from other places of the world. The shallow narrative coverage of text on the description of projects' impacts, made it necessary to compensate with a large sample size (Lee, 2004). However, after data mining the available sampling frame contained only 369 project documents related to Africa, all the cited projects were included in the analysis. Though the identified database was established in 2004, it contains information on projects implemented in the 1990s. The target period for this study's data was set to be between the years 2003 and 2014. The coverage is matched with the inception of the WSIS (2003), at which point in time the declared intent of achieving a world-wide information society was first articulated (ITU, 2005).

4.3.5 Textual data retrieval from the databases

Data retrieval is a stage involving the actual capture of data from the data source. Fossey, Harvey, McDermott and Davidson (2002) caution on the diligence required, and stipulate that regardless of the analytical method identified, the approach chosen has to be effective. For this reason, data relevant to themes were identified first, following the themes theoretically developed on the basis of the research questions and the conceptual framework. These themes were then used to label the search terms. Appendix A:1 provides a summary of the research themes and the corresponding search terms.

4.3.6 Data analysis

Data analysis is a stage that involves the exploration of data using analytical categories/themes, where the themes may be inductively derived; that is left to emerge from the data, or deductively developed (Pope, Ziebland, & Mays, 2000) for, for example, an exercise involving the testing of a theory (Gummesson, 2003). Data analysis entails "data coding, reduction and display" (Miles & Huberman, 1984, p.24). The process of data analysis may include complete excerpts from the raw data, an action which Fereday and Muir-Cochrane (2008) prescribe as useful in ensuring that 'data remains directly linked to the original text' in the process of interpretation.

In this project, complete project descriptors as abstracts were imported in the qualitative software ATLAS.ti 7 as 'project data units'. Then complete sentences, or where necessary a

passage, were considered in coding thematic constructs according to the recommendations in the scholarship of literature (Fereday & Muir-Cochrane, 2008; Miles & Huberman, 1984)

Content analysis techniques were deployed to accomplish the process of data mining. Following in the next section is a brief description of the technique.

4.3.7 Content analysis methodology

Content analysis employs a wide range of analytical techniques to analyse documents obtained or generated in the course of research (White & Marsh, 2006; Schilling, 2006). The methodology provides for derivation of analytic constructs from knowledge of experts or experience, preceding research works, or existing theories and practices. The analytical constructs manifest in the content of communication and guide the researcher to determine the presence of certain words, concepts, themes, phrases, characters or sentences within texts (Palmquist, 1990; White & Marsh, 2006). Content analysis is built on a set of definable rules and procedures that are replicable whenever validation of findings or reliability tests need to be done (Reichertz, 2004). According to Reichertz (2004), the extraction of words, concepts or themes, need to be carefully guided, on the basis of pre-set assumptions. These could be theoretical or framework driven assumptions. For instance in this study, such assumptions are grounded in the necessary requirements for the productive diffusion of GPTs and CA frameworks.

The fundamental assumption in content analysis is that text and context are independent of each other. Therefore, a researcher is, through this method, capable of drawing conclusions from one domain, such as text; and then making inductions to the other. Mayring (2000), as cited in White and Marsh (2006) expands the idea that the communicator, the message or text, the context surrounding text creation, and the effect of the message, are the range of subjects about which conclusions can be drawn from content analysis.

In the conduct of content analysis on a text, the text is coded into manageable categories that are relevant and valid on the thematic level (Palmquist, 1990; White & Marsh, 2006). Conceptual analysis and relational analysis are two techniques used for content analysis. When applied to the coded text, the emerging patterns are used by the researcher to reason inductively (or deductively) about the writer, context or audience.

Conceptual analysis is concerned with establishing the existence and frequency of concepts in a text. Relational analysis can then be applied onto the conceptual analysis results, to examine relationships among concepts (Krippendorff, 1980). The reasoning is deployed starting from

conceptual points to generalizations that constitute the theorization process. To enhance the technique, conceptual analysis is extended on themes, rather than 'concepts in text', as expressed by Krippendorff (1980) and Palmquist (1990). This was also applied in this study (Section 4.3.7).

The novelty of a contribution in interpretive research is very much dependent on the rigour invested in the process of its construction. Unlike positivistic and quantitative research, rigour in interpretive research cannot be expected in statistical designs (Gregor, 2006; Lee, 1989). As important as it is, rigour is an anchorage of a construct in the broader context. It has to be assured in qualitative research as well.

To ensure for rigour, validity and reliability, this study embarked on a comprehensive analysis of the ICT field undertakings, by seeking to be exhaustive of available data in the sampling units.

4.4 Chapter conclusions

This chapter has dealt with four aspects of the study: (1) the description of the research paradigm; (2) the framing of the interpretive scheme; (3) the nature and sources of empirical data; and (4) the expression of the approach for data analysis and empirical findings.

For the research paradigm, I looked into the aspects of ontological and epistemological orientations of the study, and I demonstrated that this study fits in the social constructivism ontology and an interpretive epistemology.

Regarding the interpretive scheme, the broad context of reference signified as the Information Society social-technical context or the IS-world, was described as being comprised of two contexts: The *context of diffusion* (also referred to as the micro-level or grassroots context); and the *context of origination* (the macro-level or global context).

The hermeneutics cycle approach for sense-making of field observed phenomena in relation to the unit social whole was described in the chapter. It was demonstrated that the organization of empirically gathered knowledge regarding the theoretical and conceptual framework constructs for interrogation, is to be grounded in the established philosophical foundations, which were established at the point of developing the agenda for research in Chapter 1.

In this chapter, I also described the mechanism for validity and reliability, as the necessary qualities for the justification of interpretivist generated knowledge. It was explained that the

means through which to control for the impacts of my subjectivity on the interpretations, are maintaining '*interpretive awareness'* and *'intentional fulfilment'*.

As to the approach for empirical observations the chapter noted that the adopted design is qualitative. The data for observations are the ICT-based projects' descriptive textual materials, and are obtained from the electronic databases of WSIS Stocktaking, and the IDRC during the period 2003 to 2014. It was noted that content analysis techniques will be used as the tools for data analysis.

Having presented the methodological approach for empirical practices in this study, the study's findings and interpretation can be described in Chapter Five.

CHAPTER FIVE: Analysis, Findings and Interpretation of Findings

5.0 Introduction

Chapter Four described the methodological approach for the empirical exercises. It explained that the paradigm of the study is interpretive, and then explicated the methods for data collection and analysis. This chapter explores the empirical threads of the research sub-questions emanating from the literature review in Chapters Two and Three. It also explores the operational constructs of the study's conceptual framework mapped in Section 3.4. For the exploration, the empirical conceptual framework is first developed in Section 5.1.

The qualitative data analysis software ATLAS.ti 7 was used, together with the scholarship of content analysis, to qualitatively explore text data available in the WSIS Stocktaking and the IDRS databases. The findings and the interpretations thereof are also presented after data analysis, leaving the discussion pending until Chapter Six.

The remains of the chapter proceeds as follows: Section 5.1 is an expression of the empirical framework and the observatory dimensions. Section 5.2 underpins the data analysis process with ATLAS.ti. Section 5.3 forms part of the empirical observations, and presents the regional distribution of ICT projects across Africa. Section 5.4 presents the empirical thematic observations, followed by the outline of findings in Section 5.5 as levelled against the Section 5.1 observatory dimensions. Section 5.6 concludes the chapter.

5.1 Empirical conceptual framework

The empirical conceptual framework is organized around three dimensions. Dimension One (D1) drives the perspectives in practice. Dimension Two (D2) underpins the working theory to practice. Dimension Three (D3) underpins the conceptual framework to practice.

The empirical conceptual framework is illustrated in Figure 5-1. The three dimensions are then described, and a summary of the dimensions, together with the associated research sub-question, relevant threads in the literature, and observatory variables, is provided in Table 5-1. The observatory variables are then described in more detail in Table 5-2.

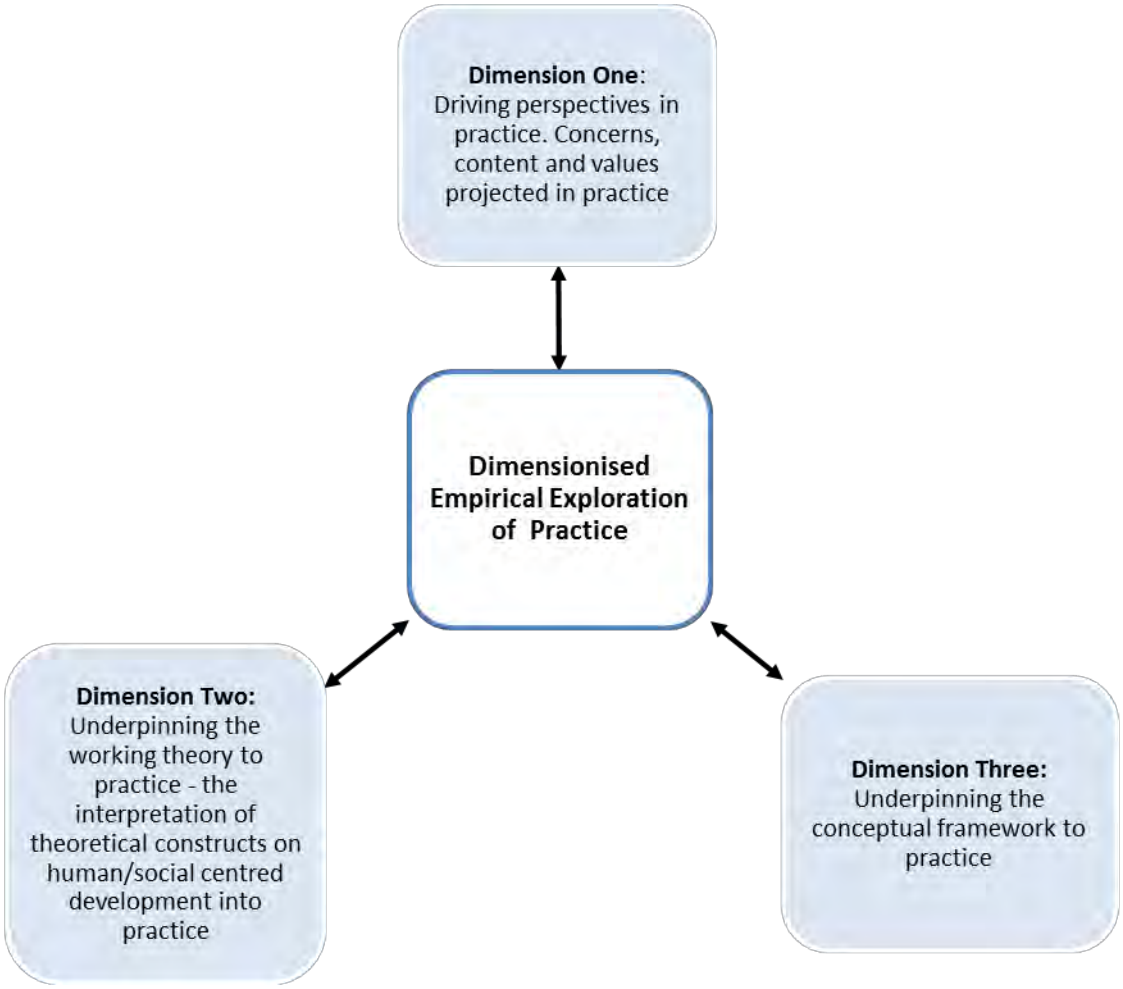


Figure 5 - 1 Empirical conceptual framework

Dimension One is driven by the constructs on the values inherent in the development and implementation of ICT4D interventions, channelled via the methodological perspectives, the perspectives on the approach to development, and the basic assumptions made on the impacts of ICT in transforming poor and digitally deprived societies (Section 1.3.4). The exploration in this dimension is informed by the expected knowledge outcome of research sub-question One (Table 1-1), and the threads developed in the sections of literature review as indicated in Table 5-1.

Dimension Two is an exploration of the empirically observable perspectives of CA in applied ICT. The observatory variables for this dimension include the key role players; the focus of the provider community (utilitarian versus human development); human development; and social innovations. Hypothetically, the internal and external to ADC contexts stakeholders in the processes of applied ICTs, are motivated by different viewpoints and interests.

Consequently the affiliation of the key stakeholders in the efforts to impact on development with ICTs, should reflect on the developmental focus promoted in practice, such as for artefacts or social needs. The exploration is informed by the constructs on unlocking individual and social innovation capabilities and human centred development.

Dimension Three is driven by the thesis' conceptual framework, as developed in Section 3.4. The search is for the GPT qualities in applied ICT for development. This is a test for potentials in practice to enhance the transformational factors of ICTs. The exploration is informed by the variables emergent from the literature review Section 2.2.1, in which the promoting characteristics of GPTs for their uptake and economic influence were explored.

The empirical conceptual framework illustrated in Figure 5-1 provides the framing for the observatory work by listing the observatory variables and the associated threads in the literature review.

Table 5 - 1 Description to the Empirical Conceptual Framework (Dimension One)

Dimension One **(Section 1.3.4)** Methodological Perspectives; Perspectives on the approach to development; Basic assumptions on ICT impacts
Research Sub-question One: Knowledge Search Understand current perceptions on the scope of the impacts of ICTs on socio-economic processes, how those perceptions impact on the diffusion of ICT in DCs, and what the knowledge gap is with respect to ICTs influencing social development via 'social innovation'. **Threads in literature review:** • **Section 2.1.3** To what extent is developing capacities to participate in the development of ICT solutions a concern of applied ICT? • **Section 2.1.5** What are the grounded implications of practice with respect to identified concerns and the developed content and values in applied ICT? • **Section 2.2.3** Do technology transfers include establishing avenues for the production of ICTs in DCs? **Observatory variables:** • Who are the **key role players** in applied ICTs? • What is **the focus of the provider community** of practice and the way they compose the approaches for ICTs for development • What are the **'key initiatives'** involving the international stakeholders in the promotion of ICTs for development

Table 5 - 1 (continued) Description to the Empirical Conceptual Framework (Dimension Two and Three)

Dimension Two

The interpretation of theoretical constructs on human/social centred development into practice

(Sections 1.1.3; 3.1; 3.3.2) Grounds for the working theory of this study: SI in the perspectives of CA

Research Sub-question Two: Knowledge Search

Develop a broad understanding of 'social innovation' in the context of ICT diffusion processes that is beyond the artefacts worldview and the theoretical baking for that understanding.

Threads in literature review

- **Section 3.1; Section 3.3.2** Do the implementations in practice focus on unlocking individual and social innovation capabilities for people to address their own development?

Observatory variables

- Signs of promoting for individual/social capabilities in innovating for ICTs
- The role of the agency: Internal versus external stakeholders in the processes of applied ICTs have different viewpoints and interests. Thus, **the affiliation of the key role players** reflect **on the developmental focus** promoted in practice, such as artefacts versus social needs.

Dimension Three

Does practice guarantee the diffusion of ICT-GPT defining values?

(Sections 2.2, 2.2.1, and 2.2.2; Section 3.4) Aligning practice with the theoretical ICT-GPT to enhance labour quality, capital deepening, and productivity in the economies of ADCs as a viable way for generating long-term productivity and transformational impacts of ICTs

Research Sub-question Three: Knowledge Search

An understanding of the operational potential of the study's hypothesised SI in the current state of affairs in the community of ICT, and the corresponding theoretical and operational gaps.

Threads in literature review:

- **Section 3.4** Conceptual Framework for ICT-GPT

Test variables: Factors that enhance the diffusion of ICT-GPT:

- Pervasiveness;
- Innovation complementaries;
- Complementary investments;
- Emergence of ICT related sectors and inter-sectoral linkages.

Table 5-1 listed the observatory test variables. In Table 5-2 these variables are described in detail.

Table 5 - 2 Observatory Plane: The variables and their descriptions

Observatory Variable	Description
Dimension One	
Concerns, content, and value grounded in practice	Conceptual drivers of practice in the identification of concerns and the development of content and values; the selection of implementation methods and approaches; and the expected end results
Key role players	Who drives the interventions? What is the status of local participation in the intervention (Origination, Sponsor, Lead entities etc.). Are the key role players at Community level e.g. local initiative; or are key role players at national level e.g. government initiative; or are key role players at an international level e.g. international initiative.
Focus of the provider community	What is valued as 'success' of applied ICT, and in whose perspectives? For instance: Are the target impacts defined *a priori*? What are they and in whose favour do they operate? Is it the community, or are the expected end results of the project initiative nationally or internationally established?.
The key initiatives	The key initiatives viewed as the areas of concentration among the international stakeholders (WSIS, UNCTAD, ITU, etc.) in the promotion of ICTs for development
Dimension Two	
Key role players	Exploration of the local input in the implementation of applied ICTs as a reflection of local voices
Focus of the provider community	The expected end results of the efforts in relation to human development and social transformation
Dimension Three	
Support for pervasiveness of ICT-GPT	Contribution to the assimilation of ICT in core competences of various economic units or sectors of an economy: For instance, is the activity in the community of practice producing ICT goods which have applicability in other processes, and which are not just an end in their own sense?
Support for the development of innovation complementaries for ICT-GPT	Contribution to innovations in other aspects of a society or economy that lead to the diffusion of an intervention: such as, promoting social creativity, imaginativeness, etc. to invent things which utilize the products of ICT interventions, such as ICT aided processes.
Support for the development of infrastructural inputs for ICT-GPT	Having provisions for removing bottlenecks to the application of mainstream innovation. For instance: Developing skills for the establishment of ICT-based institutions (R&D), building up a resource capacity for innovations, etc.
Opportunities for inter-sectoral uptakes and linkages for the ICT-GPT	Having applicability in multiple sectors which are inter-linked, such as farm inputs, manufacturing and agriculture.

Having developed the tools for observation, I now present the approach to data analysis in the next section.

5.2 The approach to qualitative data analysis

Data analysis begun with the downloading of text data describing ICT based projects implemented in Africa from the online WSIS-Stocktaking and the IDRS databases (within the period 2003 to 2014). (See Appendix A for more detail). The text materials were copied and pasted in the '*rich text format'* (rtf) of a MSWord application, and a file was created for each single project. The document files were saved under the names of the pertinent project-

hosting country. A total of 369 documents were created, which are from here onward referred to as 'project descriptors'. The project descriptors were afterwards subjected to 'data cleaning'. The outcome of the cleaning exercise was 246 projects, which were imported into the ATLAS.ti 7 software for further content analysis. According to the analysis procedures of ATLAS.ti, the imported documents are known as the 'primary documents' (PDs). Data cleaning was conducted to remove those entries that were irrelevant to the study. These included entries that related to conferences, or were simply establishing websites, or proposals for funding. Only projects already implemented and concluded, or still running, in the scope of 2003 to 2014 were considered.

The retrieved data is presented in Appendix B. Entries in the appendix are listed according to: the project name; the lead entity or agency implementing it; the location or target beneficiaries; what the project is doing; and the theme that the project addresses according to the expressions in the project's descriptors.

The retrieved data (Appendix B) was analysed (See Appendix C - the ATLAS.ti 7 backed analysis), and then the outcome was used to support the thematic synthesis, as presented in Appendix D. Appendix D was thereafter used as the basis for the answering of the observatory frame (Section 5.1).

Data analysis was essentially conducted in three stages. The first stage involved the coding of data, followed by the second stage, in which the codes were organized into meaningful associations for surfacing empirical themes. In ATLAS.ti, the codes were labelled, and then tagged with comments to clarify the relevance of the code or the target *family* (Figure 5.3). The third stage involved a comparison of empirical themes against the observatory dimensions as developed *a priori* (Table 5 -2).

The first two stages followed an '*inductive'* approach, where I sought to establish the codes as they emerged from the respective text narratives (Schutz, 1967). The third stage involved relating the concepts that I identified in literature to what they reflect or imply in practice. This followed a '*deductive'* approach (Schutz, 1967).

5.2.1. Coding of Data

Coding is the labelling process that allows a researcher to organize data into meaningful pieces of information that may lead to the discovery of patterns and themes. Such discoveries then get used in the description of observations (Fereday & Muir-Cochrane, 2008). Coding may function to provide a ground for descriptive statistics such as the frequency of incidences

in sampling exercises, or it may function to surface hidden meanings in qualitative research programs.

In the qualitative interpretive perspectives, each data element was considered according to the base theoretical concepts. It was considered that each element was important regardless of its frequency of occurrence, for the reason that the projects themselves went through stages of appraisal in their proposition stages as a prerequisite for funding. Thus, the approval of the projects represents a significant understanding of their organizing ideas among the community of sponsors. Furthermore, receiving approval for funding and implementation was considered to be evidence of the project's relevance in terms of the expected impacts reflected in the project's descriptors.

Each PD (primary document) was read as a principle (Friese, 2013) and its contents were coded accordingly. Based on the similarity, code categories were developed, which were further organized into different families reflecting the themes of literature the project was answering to. For instance, if a project is motivated by *providing access* as the key word in the project narratives, then '*promoting access to ICTs*' is the underlying theme. According to the principles of hermeneutics, the logic of coding is an indication that the quotation, image, text, or any piece of data is characteristically a subset of a larger grouping (Friese, 2014). The process facilitates the development of a virtual image of a full, or near-full object as a sum of its elements.

5.2.2 Thematic analysis

Thematic analysis was done with the help of the '*Family Manager*' module and the '*Super Family Tool'* of ATLAS.ti. During data analysis, *'families'* of data elements were established. *Families* were used to group data into relating constructs. *Families* can be established on the like items, such as PDs, codes or memos. The '*Super Family Tool'* was used to construct *families,* which were later used for observations with respect to the observatory dimensions (Figure 5-1). Analysis of the thematic *'families'* yielded outcomes, that served as frames for the broad perspective reflections and articulation of constructs in the context of the research conceptual framework (Section 3.4). Generally, the identification of '*families'* or data categorization allows researchers to "compare observations in terms of similarities or differences" to frames of reference as also applied in Dey (1993).

Figure 5-2 provides a presentation of the quotations at the bases of the themes, as conducted with ATLAS.ti. The quotations are identified by a pair of numbers and the list name. The first number in the pair represents the serial number of the PD from which the text comes from, and the second number is the serial number of the quotation in the PD (Appendix A). The numbers serve to locate the quotation in ATLAS.ti. The quotes are related to codes via the arrows. The codes help to point out the interpretative meanings born in the quoted text. For instance, in the interpretative meaning reflected in quote 1:16 - *"the cost of access to information and communication technologies (ICTs) in Africa remains the major impediment to the participation of Africans in the networked society…",* the information society is addressing the *cost* concern through promoting issues of *'access and use of ICT', 'ubiquity'*, and *'ICT infrastructure'* in relation to literature, and according to the related projects' expressed expected impacts.

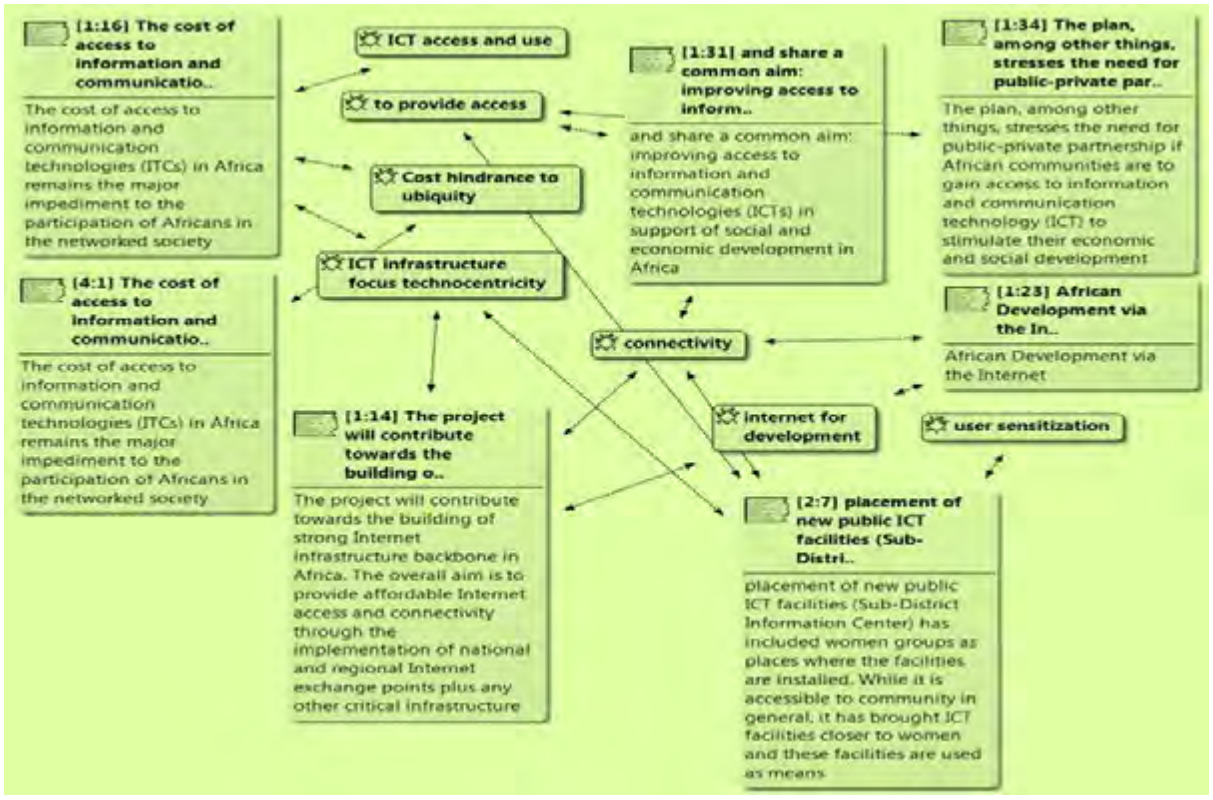


Figure 5 - 2 Quotations – Coding Output of ATLAS.ti 7

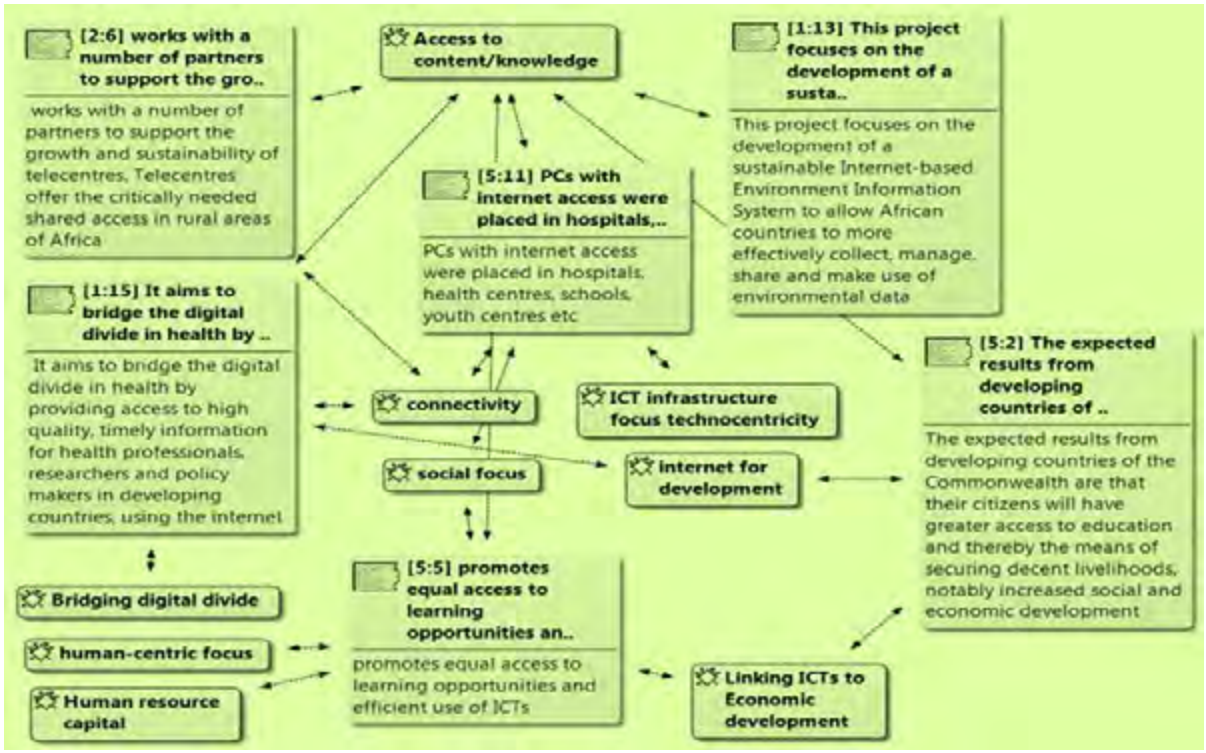


Figure 5 - 3 (Continued) Quotations – Coding Output of ATLAS.ti 7

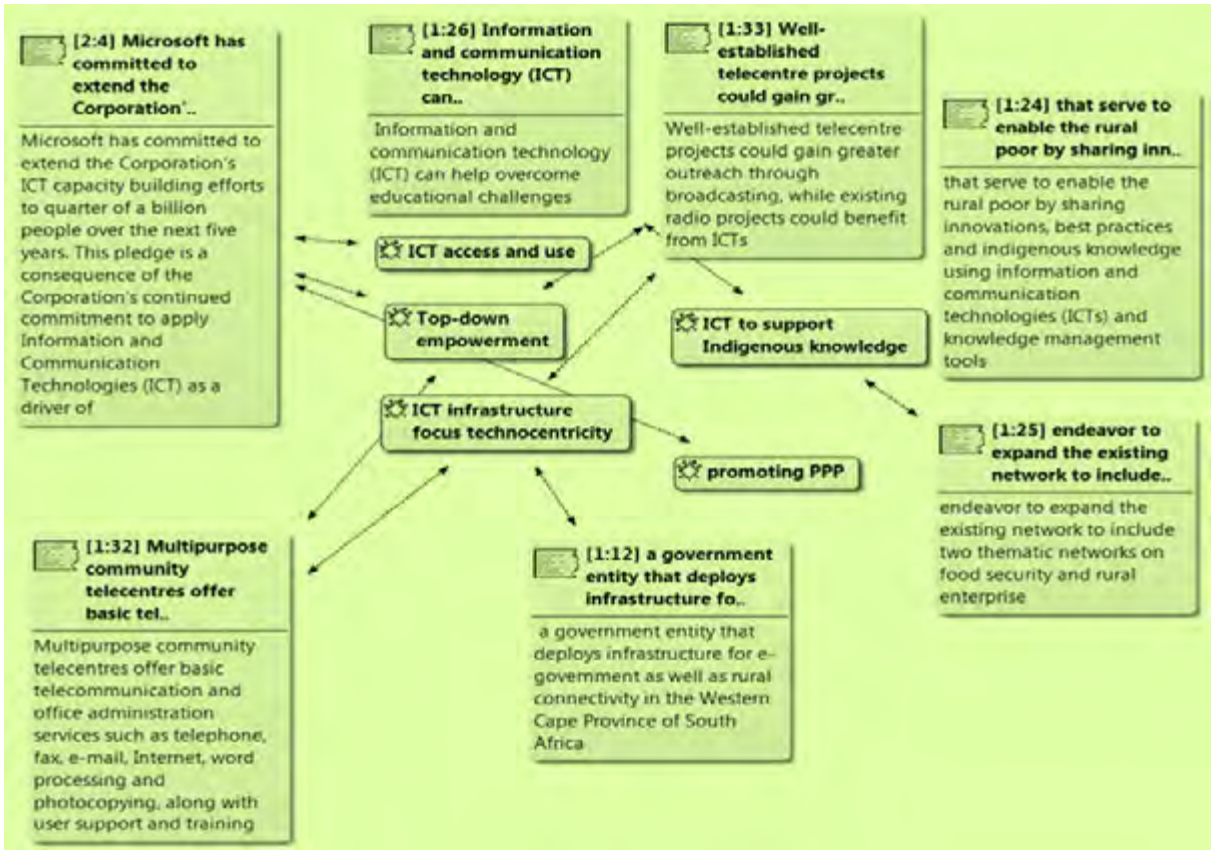


Figure 5 - 4 (Continued) Quotations – Coding Output of ATLAS.ti 7

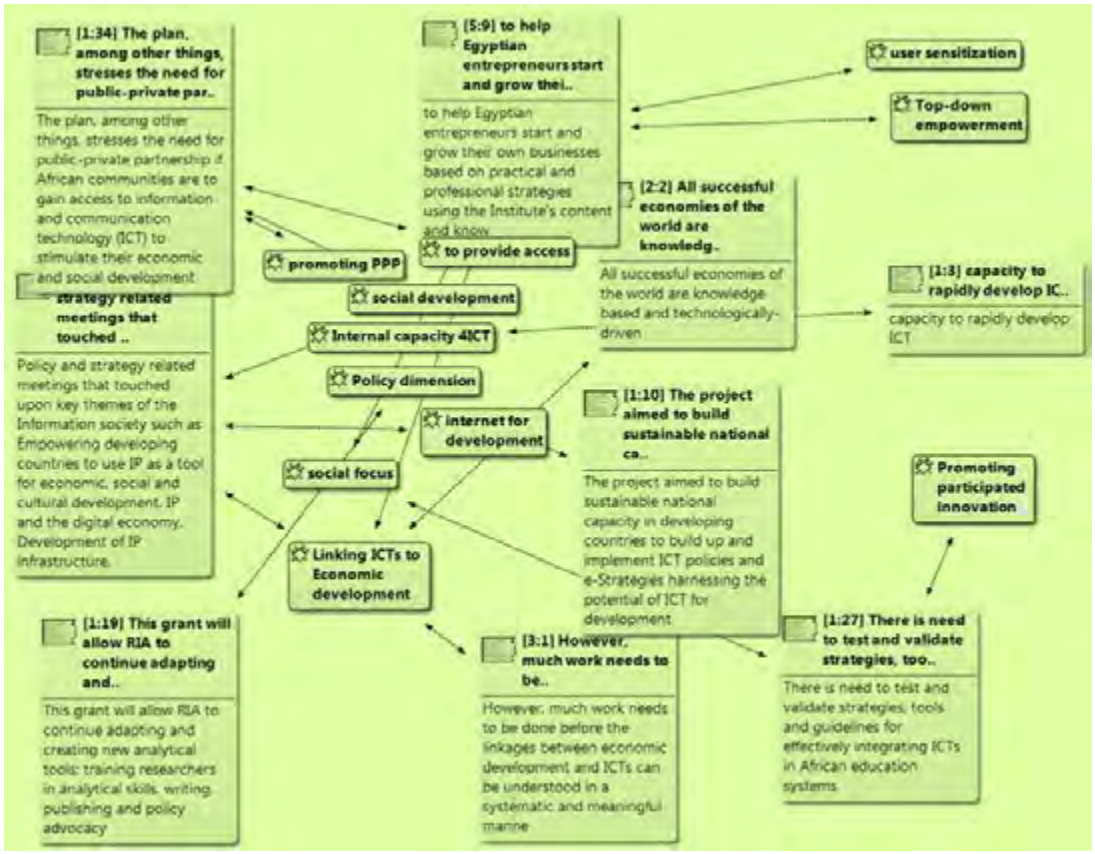


Figure 5 - 5 (Continued) Quotations – Coding Output of ATLAS.ti 7

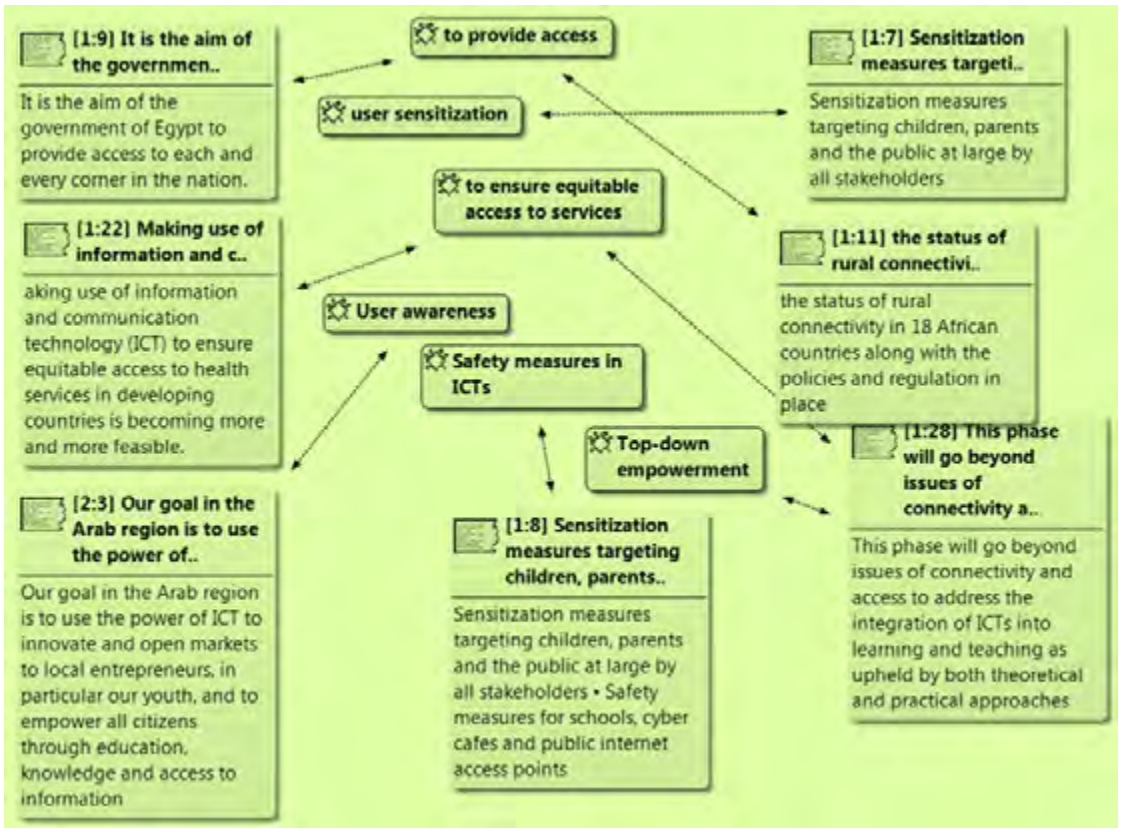


Figure 5 - 6 (Continued) Quotations – Coding Output of ATLAS.ti 7

From the quotations-coding process presented in Figures 5-2 to 5-6, follows the establishment of the code-to-code relations, which further facilitates the development of code families leading to the identification of empirical themes (Appendix D). The process is accomplished by first identifying links in codes and families (Figure 5-7). For example, the concepts that would promote the socially embedded capacity to innovate are grouped under the '*Focus on Socially embedded capacity for innovation'* family. This includes the codes such as *'internal capacity for ICT', 'promoting participated innovation', and 'social focus for social development'* This is illustrated in Figure 5-7.

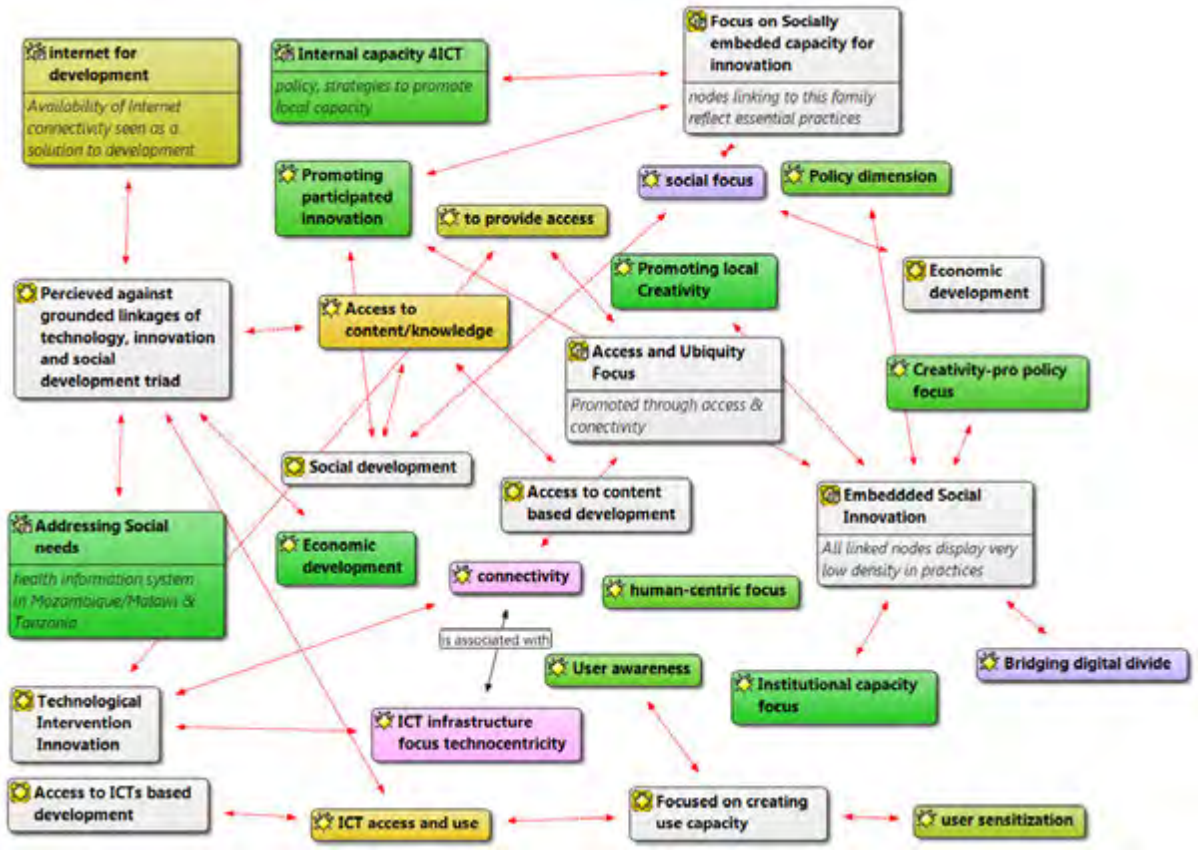


Figure 5 - 7 Family - Code Relation Analysis

The code assemblage process undertaken in Figure 5-7 yields the families, which are further summarised into major organizing theoretical themes presented in Figure 5-8.

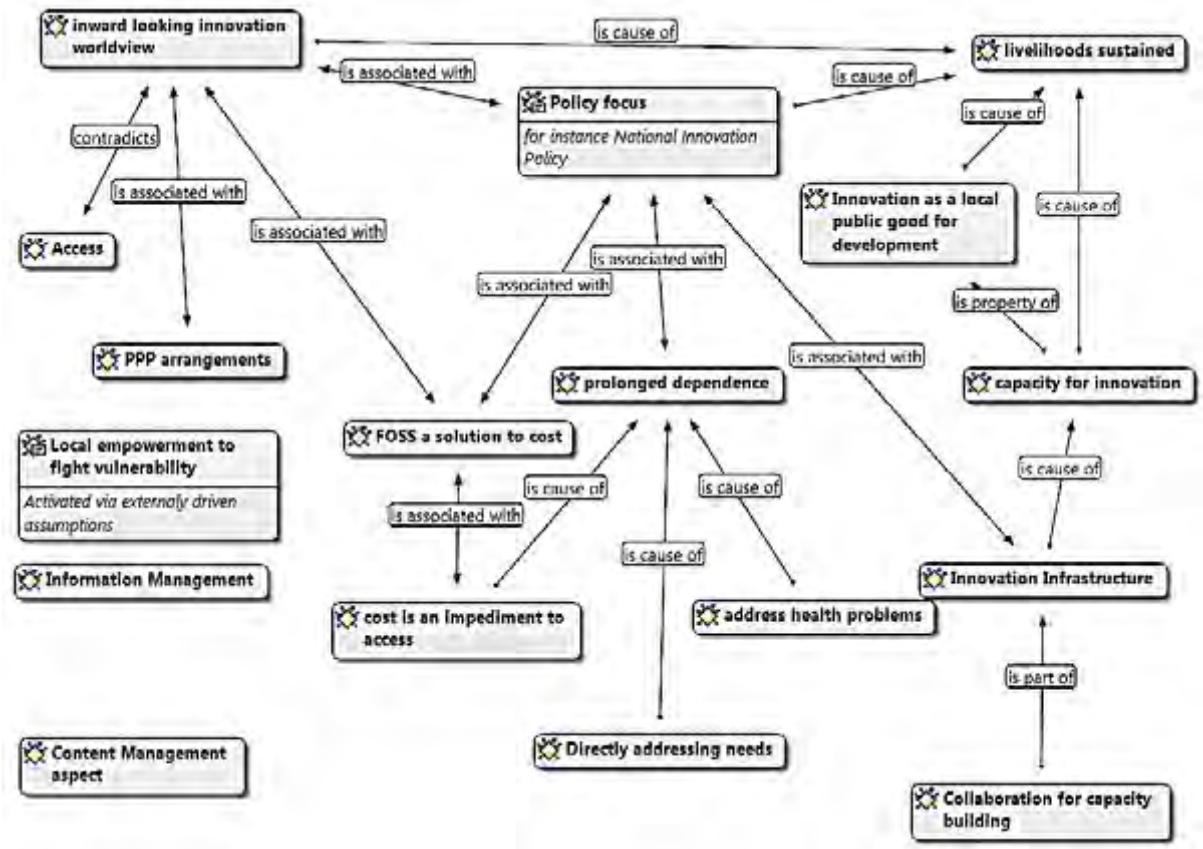


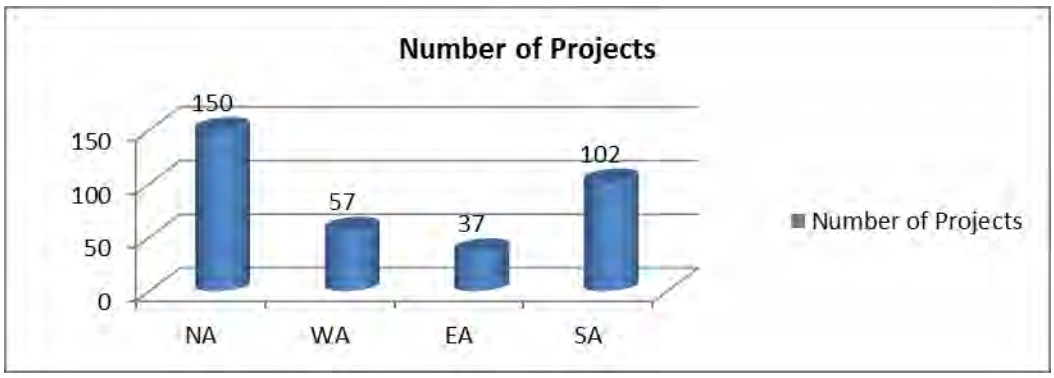
Figure 5 - 8 The Network View of Codes and Code Family Relationships

The network of family summaries featured in Figure 5-8 is key to making observations. The network paths are labeled to indicate the effects they relate through, according to the arguments I developed in the study. For instance, 'inward looking innovation worldview' has potentials to promote sustainable wellbeing; capacity to innovate has a direct 'cause effect' relationship to sustainable livelihoods; while the capacity to innovate is at the same time reliant on innovation infrastructure but is not the only factor. From empirical observation, there is much emphasis on infrastructural interventions (see Appendix C for the frequency, it was found in 8 projects), without a corresponding emphasis on promoting innovation as a local public good through relevant inward-looking policies or local capacity building. In Section 5.3, a listing is provided of observations in a summarized manner.

5.3 A Taxonomy of ICT based Projects in Africa

Figure 5-9 illustrates the distribution of the projects by region within Africa. 'NA' refers to North Africa, 'WA' refers to West Africa, 'EA' refers to East Africa, and 'SA' refers to Southern Africa in the figure.

Figure 5 - 9 Projects Distribution by Region on the Continent of Africa



The regional disparity on the distribution on ICT related initiatives observable in Figure 5-9 has some implications. It is quite obvious that a region such as East Africa is on the disadvantaged side if emancipatory efforts are not made from within this region.

Figure 5-10 is derived from Appendix B, and indicates the dominance of the exogenous stakeholders in the inception and execution of ICT projects in Africa. Of all the projects featured in Appendix B, only 10% were executed by either African governments or other endogenous entities. The remaining 90% were accounted for by exogenous entities. This is an indication of where the agency may be located, but could also be considered to be evidence of power domination based on knowledge, but vested with other political or economic interests. Such an interpretation depends on which role the international 'agency' is considered to be playing. It can be recalled from literature that agency has the identity of origin inscribed in it (Giddens, 2009). Therefore, it can be argued that the research evidence points to the agency lying with the exogenous entities and not with the African ones.

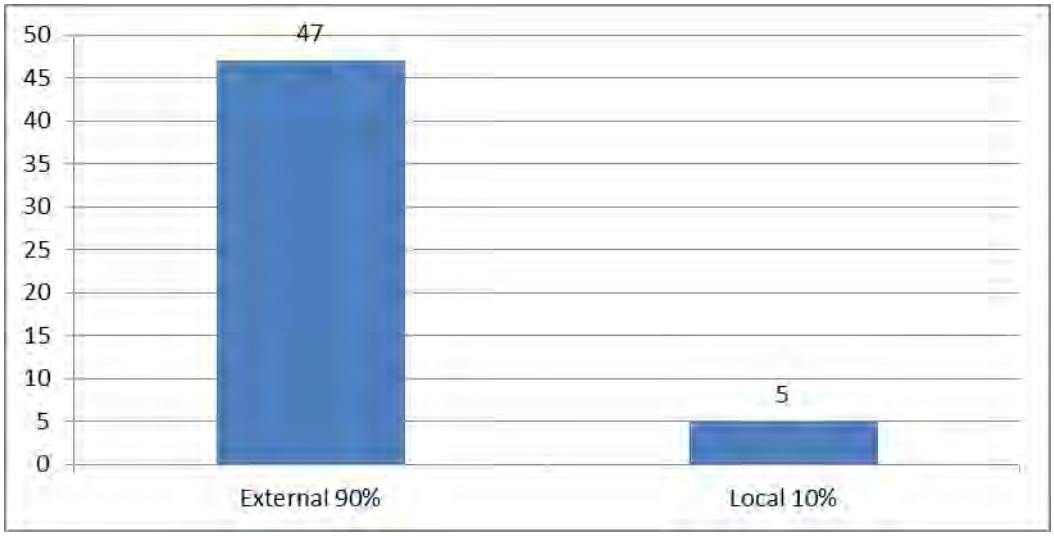


Figure 5 - 10 Affiliation of Project's Lead Entities

5.4 Empirical observations

The empirical observations are presented at two levels. First, there are the general observations (GOBs) that emerge from the patterns in the analysed data. These are not confined under any specific observatory dimension established in Table 5-2. Second, there are the observations that are defined according to the observatory dimension specified in Table 5-2. These two levels are discussed further below.

5.4.1 General Observations (GOBs)

There are three observations of a general nature, labelled as GOB 1 to 3, that can be made.

(a) **GOB1** - The leading force in the initiation and implementation of applied ICT interventions for development in ADCs is external to the contexts of application. Figure 5-10, in conjunction with the featuring of lead entities in Appendix B, provide clear evidence for this observation; only 10% of the investigated projects were endogenously initiated, with the remaining 90% being initiated and implemented by exogenous agencies. Consequently, the voices of State powers as agents of citizens do not feature significantly. The situation is the same in the aspects of policy, financial resources allocation, and the determination of the modes that the interventions should take.

(b) **GOB2** - The distribution of the initiatives is highly skewed (Figure 5-9), North and West Africa hosted about three quarters (73%) of all the analysed projects (this applied particularly in Egypt which hosted 96 (39%) of all the analysed 246 projects). This can, to some extent, explain why the region is favourably advanced in the use of digital technology in comparison to the region south of the Sahara (but it does not explain why Egypt was the beneficiary of so many projects).

(c) **GOB3** - Local participation in formulating their own solutions for their own problems is not generally evident. What is observed instead is the existence of a 'clinical approach,' which happens to also be short-term and short-lived. This is not the case for all studies however. There are limited examples where this was not the case; one example is the project on '*Collaboration for Health Systems Analysis and Innovation (CHESAI)*' (Appendix E: IDRC project no.106788, 2012), which contends that *"critical social problems need to be addressed in a more comprehensive way … for sustainable results …. rather than a ….. clinical approach"*.

5.4.2 Observations for Dimension One: Practice grounded perceptual implications

Observations in D1 are related to the selection of methods and the approach for applied ICT in addressing the digital divide in ADCs. Observations were made along the grounded perceptual drivers of practice and the underlying basic assumptions. Observations in this category are labelled as D1.1 to D1.3.

The observatory variables for D1 include the following: key role players in applied ICTs; focus of the ICTs provider community of practice; and key initiatives.

(a) D1.1 – The key role players

There is very little evidence of local drive in the choice and initiation of ICT projects. Significant key players are the international development organizations and other bodies affiliated to the United Nations. These include the IDRC, ITU, UNCTAD, UNESCO, UNDP, NEPAD, WSIS etc. Their key goal is to curb the 'digital divide', realize MDGs, and stimulate development in developing countries.

(b) D1.2 – The focus of the provider community

According to the evidence in the '*No. of Projects (in which) a code appears*' (Appendix C), the *quotation scheme* (Figures 5-2 to 5-6), and the *codes* and *family* mappings (Figure 5-7), the dominant focus of the initiatives for addressing the digital divide and knowledge poverty in Africa is on providing access and connectivity. In turn, this theme drives the deployment of 'telecentres' as the solution to lack of 'access' and 'connectivity'. The code described by 'access' and 'connectivity' featured in 168 (68%) projects, with 130 (77%) of them focusing on telecentres as offering a solution to access.

(c) D1.3 – The key initiatives

The observed key initiatives include the action lines of WSIS and the objectives of IDRC, UNCTAD and ITU. These are: promoting access to information and knowledge; capacity building for ICT uptake; international and regional cooperation; the role of governments and all stakeholders in the promotion of ICTs for development (WSIS); encouraging research on developing countries' problems (IDRC); developing indicators for monitoring and measuring ICT performance in developing countries (UNCTAD); and connecting the world (ITU). The WSIS initiative is supposed to cover *ICT for sustainable development, national e-strategies, ICT in parliaments, e-participation, and Partnerships*.

This further demonstrates the top-down imposition of ICT power on the disadvantaged block.

5.4.3 Observations for Dimension Two: Evidence of CA perspectives in practice

Observations for this dimension are labelled as D2.1 and D2.2. The observatory variables include: The key role players; and the signs that capabilities perspectives are being promoted in the provider community's initiatives (whether individual or social).

(a) **D2.1 - The key role players**

The key role players sought are those dedicated to fostering human development. IDRC is one such player, as it recognizes the role of ICT in human development (IDRC, 2010).

(b) D2.2 - Promoting individual / social capabilities to innovate for ICTs

The search of the databases for evidence of a social / human development focus in practice had just one return. The key words used included *social innovation*, *social development*, *human development*, and *capabilities.* Two results were returned corresponding to the research period in scope (2003 – 2014), one from the WSIS stocktaking, and the other from IDRIS. The returned result from WSIS database is a Mobile IT project in one of the African countries, which involves a mobile unit comprising of a computer mounted vehicle with internet access for training rural communities in computer literacy. The other with relevance to application of ICTs for human focused ends was obtained from the IDRIS database. This involved the application of ICTs to enhance equal access to health in Francophone Africa.

5.4.4 Observations for Dimension Three: Grounds for the ICT-GPT in practice

Observations in this dimension are based on the search for evidential presence of the factors that would enhance the diffusion of ICT-GPT. The used variables are: support for pervasiveness; support for the emergence of innovation complementaries to major innovations; development of complementary investments; and promotion for ICT-related sectors of economies. The observations for this dimension are listed in the series of D3s.

(a) D3.1 – Factors enhancing diffusion of ICT-GPT

The prior development of the ICT sector itself in developing countries before it supports ICT development, is not a theme in practice. There were instances of government role-playing to support the growth of the private sector, specifically small and medium

enterprises; but similar support for the development of other indigenous activities or sectors, such as agriculture and fisheries, is not evident.

(b) D3.2 – Instances leading to Pervasiveness in favour of ICT-GPT

There is no evidence of initiatives in the community of practice to produce ICT goods which have applicability in other processes and are not just an end in themselves.

(c) D3.3 – Instances leading to the development of innovation complementaries:

There are no significant instances of initiatives with emphasis on stimulating social creativity and imaginativeness, creating gaps for ICTs in manufacturing or business etc., or emergence of ICT aided processes.

(d) D3.4 – Instances of development of infrastructural inputs for the mainstream ICT-GPT innovation:

Observed are the efforts for establishing 'informational' highways. There is no evidence of initiatives to remove bottlenecks in, for example, the application of mainstream innovations such as establishment of ICT based institutions (R&D), and building up a resource capacity for innovations.

5.5 The Dimensional Findings

In relation to the observatory dimensions (Table 5-2, Section 5-1), the following findings were identified:

5.5.1 Dimension One: Practice Grounded Implications

Dimension one – observation 1 (D1.1) is related to the key role players that drive the interventions, and the status of local participation in the field of applied ICT in terms of Origination, Sponsorship, Lead entities, Policy components, and Institutions. The findings for D1.1 were as follows:

(a) **D1.1-F1 -** Applied ICT for development is dominated by exogenously conceived ICT solutions that are imposed on local contexts. This is a top-down approach. Inherently the initiatives are driven by the interests of external political relations. The impact of this can be observed in the skewed distribution of projects on the Continent as displayed in Section 5.3.

(b) **D1.1-F2 -** From D1.1-Fs (and the analysis of ICT projects in Africa shown in Appendix B), it can be inferred that there is evidence of unbalanced power relations in the

information community of practice. This appears to be the type of power that emanates from the command of knowledge (French & Raven, 1959; Goldhamer & Shils, 1939). This finding tends to reinforce Brocklesby and Cumming's (1996) observation that "externally conceived technological innovations are not free of power" (p.741).

D1.2 related to the focus of the provider community and what is valued as 'successes' of applied ICT, and in whose perspectives these successes are viewed. For instance: Are the target impacts defined *a priori*? What are they and in whose favour? There is one finding to this observation, labelled **D1.2-F1** below.

(a) **D1.2-F1 -** At the macro level, the practices adopted for the deployment of ICTs were found to fall into the following four main classes:

(i) Interventions with technical innovations: These include investment in telecentres; e-governance systems; web portals for governments, youth and women; and investment in digital communication infrastructure.

(ii) Interventions with public innovations: These interventions are motivated by providing public 'access' to ICTs and 'connectivity' to 'knowledge' via internet, as a solution to digital marginalization.

(iii) Interventions with use innovations: These interventions focus on promoting the 'use' of ICTs. The action lines are to push for the deployment of informational ICTs in potential areas for use, such as the small businesses and social portals.

(iv) Interventions with transformational innovations: The target of this group of interventions is to 'transform' communities from backwardness and technology ineptness into knowledge societies. The *modus operandi* in these innovations is 'technology transfer'. The implicit assumption in this category of interventions is that the poor people are poor because they are 'digitally excluded'.

D1.3 referred to the key initiatives observable in practice. The findings of this aspect are as follows:

(a) **D1.3-F1** - The key initiatives are significantly defined by international organizations affiliated to the United Nations. The observed key initiatives include the action lines of WSIS and the objectives of IDRC, UNCTAD and ITU. National level initiatives do not feature in the documents and repositories of international reach, such as the IDRS and WSIS stocktaking. This signifies the existence of limited local agency input in initiatives

to address the digital divide, or to utilize ICTs for different aspects of human and economic development, at least as far as UN affiliated organisations are concerned.

5.5.2 Dimension Two: Evidence of CA perspectives in practice

As was the case in 5.5.1, for the observations made for Dimension Two, the reflective findings are labelled in the series of D2.1, with F next to the corresponding observation. D2.1 referred to the key role players, and D2.2 referred to whether or not individual or social capacities to innovate for ICT were included. The findings were as follows:

(a) **D2.1-F1 -** 'Human development' is reflected to be in the perspectives of some international stakeholders in ICT4D, specifically the IDRC, WSIS and ITU. The absence of DCs' space in the promotion of ICTs for human development is vividly visible. It is neither in implementation initiatives, nor policy gestures.

(b)**D2.2-F1** – Pertinent to observation D2.2 Section 5.4.3, there is no evidence in practice to suggest that the theoretical constructs that advise for the use of ICT to extend the freedoms of the people (Section 3.1) are so interpreted in practice. The observations obtained do not link to enhancing innovativeness, or participated development of ICT solutions for development in ADCs.

5.5.3 Dimension Three: Guarantees for the ICT-GPT in practice

For Dimension Three, it was observed that the prior development of the ICT sector itself in developing countries, is not a theme in practice. Applied ICT for development in its current form and setting does not carry components that can enhance the diffusion of ICTs in the characteristics of GPTs. The observations related to the descriptive dimensions of the diffusion process of GPTs (Section 2.2) lead to the following findings been made: (these are labelled in the sequence of DH and the finding number):

a) **D3-F1 - Support for pervasiveness of ICT-GPT:** As regards the assimilation of ICT in core competences of various economic units or sectors of an economy and whether the activity in the community of practice that is producing ICT goods has applicability in other processes and is not just an end in themselves, *it was found that* the design end is not charged to work with economic bases. 'Development' is equated to 'use of ICTs', while ICTs are not connected to the people's actual economic activities (in microenterprises, fishing, household cultivation, or brick-making) as the literature would suggest should be the case (Duncombe, 2006, pp.82,84).

b) **D3-F2 - Support for the development of innovation complementaries:** As far as which operational interventions have worked to stimulate, or catalyse innovations in the aspects of a society or economy leading to the diffusion of an ICT-based intervention, be it for promoting social creativity; promoting imaginativeness; creating gaps for ICTs in manufacturing or business etc. as a prerequisite to inventing things which utilize the products of ICT interventions, such as ICT aided processes; *it was found that* there is not evidence that this is happening (at least among the projects reported in the databases studied). I searched for the instances where the current practices have generated any technical resource base by pointing in the direction of electronics, hardware components manufacturing, software development etc. but found nothing. Two conclusions can be draw from this:

(i) There is a complete lack of locally-driven, inward-looking, social innovation processes in the whole scenario of deploying ICTs in developing countries for bridging the digital divide, curbing knowledge poverty and establishing knowledge economy.

(ii) The practice part of ICT interventions in Africa are focused on providing solutions to problems that have been exogenously defined, and are not building local capacity to generate local solutions to locally identified and defined problems, within the local understanding, which is what the social theories - such as the Gidden's structuration theory, would propose.

c) **D3–F3 - Support for the development of infrastructural inputs for the mainstream ICT-GPT innovation.** With regards to whether provisions are made for removing bottlenecks to the application of mainstream innovation, by for example, developing skills for the establishment of ICT-based institutions (R&D), building up a resource capacity for innovations, etc; *it was found that:* there is no enough evidence in practice to show the presence of significant institutional role-playing in developing countries themselves, for the purpose of promoting national innovation systems for endogenous motivation of development and use of ICTs. This is in contrast to Gault (2010), who suggests that the promotion of the change of systems of innovation and structures for innovation should happen at the base; that is, locally.

d) **D3-F4 - Opportunities for inter-sectoral uptakes and linkages.** As far as whether the projects listed in the databases have applicability in multiple sectors which are inter-linked, such as farm inputs manufacturing and agriculture, the findings for this are

twofold.

(i) First, investment in technology (exemplified in an insistence on digital communication infrastructure) lacks corresponding efforts in building synergies, such as information systems for health, e-governance and transparency, education,

(ii) Second, there is no significantly explicit policy input for the 'policy dimension' in the WSIS Stocktaking.

5.6 Conclusions

In this chapter, I developed and described the guiding empirical conceptual framework with three observatory dimensions: (1) the driving perspectives on the concerns, content and values in applied ICTs, listed as dimension one; (2) the evidence for the interpretation of theoretical constructs on human centred development in practice, listed as dimension two; and (3) the reflections in practice of the study's conceptual framework constructs, listed as dimension three. The study's conceptual framework constructs was developed to include the factors for the cultivated diffusion processes of GPT-ICT; namely the innovation complementaries, complementary or supportive investments, agency role-playing, and cultivation of sectoral linkages. These were inductively reasoned.

Once the guiding empirical framework was made explicit, I proceeded to present the description of the technical aspects of the study. This involved the use of ATLAS.ti in the analysis of field data, followed by the taxonomy of field observations on the distribution of ICT projects in Africa. It was observed that North and South Africa are better placed in the uptake of ICTs, as these two regions hosted about 73% of the projects listed for the period in consideration (2003-2014), compared with only 27% listed for the rest of Africa. This was seen to reflect a consequence of foreign dominance in applied ICTs, which arguably identifies the concerns for the deployment of ICTs in DCs in its own interests (assuming of course that there is even an awareness that this is what they are in fact doing – the contradictions between what the literature proposes and what was found to happen in practice suggests that there is not an alignment in practice between academia and the donor and stakeholder communities).

After the taxonomy was made explicit, I presented the general observations, noting what I see as the *unfortunate (even gross)* lack of long-term visionary input in ICT practice. This presents a limitation to locally-defined concerns, and to the development of content and values in the processes of ICT implementation for addressing the digital divide, and social

development. I also noted the observation that practice at the macro level lacks local inputs for strategized diffusion of ICT-GPT. Instead, practice concentrates on community level artefacts, addressing problems through externally conceived technological interventions.

Finally, this chapter presented my observations, made according the observatory dimensions of my empirical conceptual framework. Since I present a detailed discussion of the interpretation of findings and their implications to the uptake of ICTs in Africa's economies in Chapter Six, the discussion of the findings and synthesis of the knowledge was not provided in this chapter (Five).

CHAPTER SIX: Discussion and Synthesis of Knowledge

6.0 Introduction

The previous chapter empirically explored practice to unearth the concerns, the content, and the value in the approach and implementations followed in applied ICT. In essence, it was found that the processes for the identification of the concerns and the development of content and values for ICT projects, reflect the perceptions driving the interventions in ICT4D. The three components also impact on the form and patterns of ICT diffusion in the context of addressing the digital divide in ADCs.

In this chapter I present a detailed discussion of the findings highlighted in the previous chapter. The aim is to consolidate knowledge for the main research question, which asked: "*How to best conceptualize the ICT diffusion processes in the context of ADCs for long-term social development outcomes?"* (Section 1.6). The knowledge content for this question draws from the literature review and empirical observations with respect to the first three research sub-questions, which, by way of reminder, were as follows: (1) What are the contemporary conceptualizations of 'social innovation' and ICTs, and how are they related to social transformation for development in ADCs?; (2) Are alternative conceptualizations of 'social innovation' warranted by the prevailing social development approaches or frameworks: specifically the capabilities approach? And (3) How can practice in applied ICTs be aligned with this study's proposed conceptualizations of SI and ICT-GPT for the fostering of ICT-backed development in ADCs?

The pattern of the discussion is in accordance to the dimensions of observations and findings as they appear in Section 5.5. The outcomes of the discussion are used to inform a theory which answers to the fourth research sub-question: "*Should the state in ADCs intervene in the diffusion processes of ICTs to promote cultivated innovation for development?*" This is done so as to provide the way forward for the broad front approach for alleviating the digital divide and promoting economic development in ADCs.

In the discussion of findings that follows, inductive reasoning is applied together with deductive reasoning. Inductive reasoning is used for making sense of 'what is happening' (induction) in the process of enacting a socio-technical world (Schutz, 1967). Deductive reasoning is used to chart out a 'descriptive reasoning' in line with the presented conceptual

framework in Section 3.4. This reasoning pattern helps to underpin the incidences of technological actions as empirically observed, to the theoretical constructs in the research agenda. Furthermore, this approach to reasoning should yield potentials for cross-referenced (between theory and practice) interpretations in the production of knowledge, as also assessed by Fereday (2008).

The rest of the chapter proceeds as follows: Section 6.1 provides an itemized discussion of the findings that were made in Chapter Five. Section 6.2 is the knowledge synthesis for the main research question. Section 6.3 explicates the theoretical gap for the operationalization of ICTs at the cores of ADCs' economies, followed by the Chapter conclusions in Section 6.4.

6.1 The Discussion of Findings

Before discussing the findings, I restate here my worldview that the digital divide has to be broadly (rather than narrowly) defined in practice; and that addressing developmental issues with MDGs alone is not sufficient to lead to ICT-driven economic growth in ADCs (Sections 1.0 and 2.1). In addition, my stance is that efforts for ICT-mediated, socio-economic transformation should emerge from within ADCs themselves. The ADCs should be aware of the pertinent developmental concerns, and play a key role in developing content for ICTs within the relevance of the value chains of their economies (Sections 1.1.3 and 1.4.2). By value chains here I mean the situated economic processes of production and exchange of value.

The challenges underscored in the dimensioned discussion of the findings on the drivers of practice that follows below, should provide sufficient backing to the opinions expressed above.

6.1.1 Dimension One: Grounded perceptual drivers of practice

Dimension one looked at the grounded perceptual drivers of practice. It concentrated on the methodological perspectives, approaches, and the underlying basic assumptions. The observatory variables included the key role players driving the agenda in applied ICT; the focus of the ICT provider community, which is the basis for scoring successes or failure of ICT initiatives in ADCs; and the key initiatives in the community of information society stakeholders.

The key role players driving the ICT4D agenda

There were two key findings on the role players driving the ICT4D agenda: (1) Applied ICT for development is dominated by exogenously conceived ICT solutions, which are imposed afterwards on local contexts; and (2) There is a manifested, knowledge motivated, power relations imbalance in the dichotomy of digital supply and digitally deprived blocks (Section 5.5.1).

The current scenario is therefore that the community of sponsors drives the initiatives for ICT-based interventions. The sponsor community identifies the concerns for digitally deprived societies, then proceeds to develop the content and values in the implementations of applied ICTs.

The focus of the provider community

It was found that the focus of the community of international stakeholders is observable in four intervention fronts: (1) Interventions with technical innovations; (2) Interventions with public innovations; (3) Interventions with use innovations; and (4) Interventions with transformational innovations. The contents of the initiatives are technology transfer, mainly centred on providing internet access points, social networks, creating internet presence through websites, and so on (Section 5.4.1).

It is evident that the driver of the missions of the stakeholders is to realise returns in the short-term, as evidenced in this excerpt that calls for "a set of quick wins" as:

> *"Five years after the adoption of the Millennium declaration, and ten years before the goals fall due, world leaders have met at the United Nations in New York to declare on what further steps are needed. A set of Quick Wins needs to be designed to push the actual situation towards the target values ..... ICTs are expected to be core at this plan of action creating partnership, monitoring indicators, triggering field projects and contributing to the Millennium Development Goals" (http://www.escwa.org.lb/wsis/meetings/main.html)*

The key initiatives in Applied ICTs for development

The key initiatives signify the areas of concentration among the international stakeholders (WSIS, UNCTAD, ITU, etc.) in the promotion of ICTs for development. There was one interesting finding to this variable, namely that the key initiatives are defined by the international organizations affiliated to the United Nations. The observed key initiatives include the action lines of WSIS, initiatives to assess the state of use of ICT and impact of ICTs in developing countries of UNCTAD and ITU. They include exposing remote

communities to access to information and knowledge for achieving MDGs (WSIS) and connecting the world (ITU).

General discussion

Theoretically, technology has been logically related to development through the realization of the MDGs, where the vehicle for MDGs comprise of public 'access' to technology and 'connectivity' to 'knowledge' via internet as a solution to digital marginalization (Section 1.3.1). Thus, the United Nations' aspiration is to achieve MDGs as a solution to both development and the digital divide. For the donor community, the MDGs provide a quick way of justifying the course for commitment of resources, as well as a way to measure the impacts, and account for monetary value.

The scenario driving the deployment agenda is to address development with technology. However, this is an imposition which is not far from the 'modernization' and 'transformation' theories condemned in literature such as Heeks (2002), who speaks of a "rationality ...agenda that carries innovations from industrialized to developing countries" (107).

The interpretation of the focus on confronting health, gender, poverty and other social problems (the contents of MDGs) with artefacts has further revealed that technocentricity still drives practice for the information society. There has been considerable investment in ICT infrastructure, for instance, in telecentre facilities, which does not correspond to investment in *'relevant'* information generation and sharing in those facilities, or in facilitating online correspondences with agricultural field officers. There is no noted service in practice that is given to the realization of embedded social innovation, despite the acknowledgement of the perceptual shift in literature from technocentricity to human focussed, and the flagging of the social aspect of ICT, such as effectively harnessing ICT mediation for education, health, governance, research and knowledge.

In my observations, the above content drivers of ICT4D for MDGs as the ultimate values, cannot be the ends of applied ICTs for development, or for closing the digital gap in ADCs. In contrast, ITU statistics show that the mobile cellular telephone uptake stood at 60 per 100 inhabitants globally, and about 39 per 100 in Africa by 2008. The trend is still on the rise (ITU, 2010). This manifestation shows that the issue beyond technology innovation uptake is on how to take advantage of that uptake for economic gains. This is a call for strategic alignments; technology has to be used in a way that it will boost productivity in African economies for a phenomenal shift from subsistence levels of production. Next is to use

technology for the realization of market oriented rural economies where trade opportunities can be opened up.

6.1.2 Dimension Two: Perspectives of enhancing individual Capabilities in practice

The second dimension is focusing on implementations with the aims of unlocking individual and social innovation freedoms. The observatory variables included the 'key role players' and 'the capabilities perspectives in the provider community's initiatives'.

Key role players

IDRC is among the key role players with an articulated motive of promoting ICTs for human development. WSIS and ITU also have it as a theme in their documents (WSIS, 2003; ITU, 2015).

The respective finding to this observatory variable is that there is an open absence of ADCs as regional players in the space of promoting ICTs for human development.

Promoting for individual / social capabilities to innovate for ICTs

This observatory variable was an interrogation of practice for evidence on initiatives that interpret theoretical constructs on ICT-mediated, human-centred development. into concerns, content and values. The observation thereof showed no signs of such theory-action interpretations.

Discussion

To start with, the identified organs as the 'key players' with the connotations of human development in their mission statements, are mainly sponsors of projects, and not developers. Projects originate from a diversity of sources, in a diversity of background perspectives. This is reflected in the population of projects. The sources have their own minds and worldviews. The priorities are spoken, and many remain unspoken.

I reason out that, for the ADCs to play an influential role on ICTs for their peoples' development, they must own a great percentage of initiatives. For instance, poverty and MDGs problems need long term strategic approaches to deal with them, and a bottom-up approach, where people engage personally in the struggle. The challenge lies in building capacity at the base so that the bottom of ICT initiatives gets grounded in the contexts of significance. Examples can be drawn from the efforts already in place in other places apart

from Africa. For instance, the project '*Grassroots Innovation in China and India*' (IDRC Project no. 105170, 2010) is advocating for 'locally grounded social innovation', and the world is witnessing the strides these two countries have made in developing ICT solutions.

Accordingly, it is my suggestion that there is a need for the local agency in developing countries to take a leading role in the initiatives to actively engage ICT in the socio-economic processes through its diffusion mechanisms, in place of technology transfer. It rests upon the local agency, acting through the state for instance, to provide resources and invest in the uptake of ICT. That is, they have to invest in the processes that are capable of promoting the efforts of individuals to gain 'human freedom' (CA) (Duncombe, 2007; Sundararajan, 2000), and in the development of local patterns of behaviour that underpin various technological innovations, such as, providing incentives for citizens to engage in small scale ICT workshops; sponsoring and guaranteeing markets to small scale ICT-based ventures in their initial stages; etc. This will work to minimize technological impositions from outside the economies, or act as a source for foreign/domestic technological partnerships, which would be better than the current situation.

6.1.3 Dimension Three: Guarantees for the diffusion of ICT-GPT

Creating capacity to exploit ICT is a challenging area not adequately dealt with in applied ICT for development efforts. This is not just about 'training remote communities to use computers' as it is widely spelt in such efforts. The issue is about creating linkages between economies and technology, and understanding the related services. The excerpt below is a clear evidence for the challenge.

> *"As the presence and influence of information and communication technologies (ICTs) continues to widen and deepen, so too does its impact on economic development. However, much work needs to be done before the linkages between economic development and ICTs can be understood in a systematic and meaningful manner. …….to expand the scope of conventional investigation beyond the telecommunications industry to include other vertically integrated components of the ICT sector such as manufacturing and services" (Appendix E: IDRC Project Number 1051227 'Statistical Compilation of the ICT Sector and Policy Analysis')*

The implications of the content and value in applied ICTs over the ICT-GPT diffusion potential are discussed under the elements for diffusion which comprise of: enhancing for pervasiveness of ICT-GPT; development of innovation complementaries for ICT-GPT;

development of infrastructural inputs for ICT-GPT; and opening-up for inter-sectoral uptakes and linkages for ICT-GPT.

The support for pervasiveness of ICT-GPT

Pervasiveness is a condition dependent on ICTs having roots in some sectors of an economy, from which they should work to spread their impacts in other sectors. The current scenario in applied ICTs in ADCs cannot so generate pervasiveness. The reasons are twofold. First is the empirical finding to this aspect, where the design end of the ICTs' supply side is not charged to work with economic bases. 'Development' is equated to 'use of ICTs', while ICTs are not connected to the people's economic activities. The second is learned from literature that the economies of ADCs are at the level of small scale mining and subsistence farming (Carmody, 2009a; Scoones, 1998; Scoones & IDS, 1998). Thus, the range of sectors is limited by implication by these two reasons.

Scholars charge design in technology development with accommodating contextual considerations in its aspects (Gush, de Villiers, Smith, & Cambridge, 2010; Heeks, 2008). This is seen as a solution to enhancing the 'acceptance' of technology in targeted poor communities. In the literature, context is about attitude of the people as shaped by their culture and values. However, context for technology should be broadly defined beyond human beings. This is because it is not only human factors that impact on the uptake of technology in the first place. Equally important are the contexts for technologies. Thus, to change the macro-conditions of economies, the context to be considered in design has to include the entire set of environmental factors.

Development of innovation complementaries for ICT-GPT

Innovation complementaries are the innovations that develop as a result of the presence of a primary major innovation. These are the innovations which render the primary innovation pervasive and productive in many other forms, apart from the form in which they (the majors) emerged.

I take notice of the fact that advancements in technology, or best practice productivity levels, are only relevant to the extent that they have been translated into feasibly achievable productivity levels. Innovative and resource potential economies tend to be the first in the exploitation of major GPTs (Section 2.2.2). In the scenarios of Africa's DCs, the Governments in developing countries cannot avoid taking lessons from developed countries. Such countries have upheld funding basic science research as a seed for innovation. This is a

strategy for building capacity that is currently not an emphasis of discussions in the field of applied ICT.

The observed absence of the ADCs region's situated players in various grounds of ICT deployment, signifies that the diffusion of ICTs in ADCs is not strategized. Many opportunities exist for African poor countries if this situation can change. Innovation complementaries hold a secret for the activation of ICTs and opening-up different spheres of employment, it is argued.

Development of infrastructural inputs for the ICT-GPT innovation

To penetrate economies as high level GPTs, there must be a corresponding development of the necessary infrastructure within the very diffusion processes of ICTs. The firms in the advanced economies play a significant role in developing and implementing infrastructure for ICT in their business processes, and they have the financial resource capacity (or access to it). Not so for ADCs, where the overall industry capacity in all sectors of their economies is weak resource-wise (Appendix AA).

In the circumstances of ADCs, other types of arrangements, such as specialized institutions must be designed to take the role of mobilizing and organizing resources for specific purposes in the diffusion infrastructure of ICTs, and coordinating the diffusion process itself by identifying priority areas. For instance, the states in Africa need to charge themselves to develop and disseminate ICTs, promote infrastructure, and develop initiative roles (Harrison, 2005) as a high level institutional commitment. This is in addition to putting in place the legal, institutional, and structural framework that favours the unfolding and integration of ICT in their respective national economies, and within their societies.

The empirical exploration of practice has manifested that there is an absence of an ICT vision component in the diffusion processes of ICT in ADCs' economies. This generally undermines the GPT capacity of ICTs to take effect, let alone realize supportive infrastructure. It also leaves a vacuum for implementation of technologically focussed long-term programs, as suggested by Avgerou (2008) and Heeks (2008). This includes initiatives such as the telecentre approach (Gomez & Camacho, 2011; Huyer & Sikoska, 2003; Ncheye, 2007; Yeo, Hazis, Zaman, Songan, & Ab Hamid, 2010) and the under-sea cable system to provide a relatively cheaper connectivity of East Africa to the rest of the world (the East Africa Submarine Cable System-EASSy) (Kenduiywo, 2005; Omolola et al., 2010), which could be visionarily engaged as providing opportunities for the transformation of developing

economies. However, lack of complementary initiatives makes even such big high level infrastructural investments fail to operate sufficiently in the intended economies.

On the other hand, reliance on wholesale deliberations from international forums such as the ITU and the community of development agencies, means that many implementations are based on missions of these agencies, without being tailored to custom circumstances in the ADCs. There is a lack of local inputs due to the absence of voices from the respective local places. The technologies concerned may be appropriate as called for by scholars (Reijswoud, 2009a); but in the absence of an appropriate philosophy and a viable school of thought on social behaviour and development agenda, it cannot be possible to achieve the favourable impacts of technology.

To counteract the framed phenomenon above, I would call upon the states in Africa to have commitments on ICT diffusion pegged in certain long-term prevailing values, such as ideologies or political wills. This should function to facilitate a careful planning of expected outcomes, and drive the ICT-GPT initiatives; instead of having the international agencies drive the initiatives for the technologization of the digitally deprived communities.

Opening-up of sectors for inter-sectoral uptakes of ICTs and linkages:

The current scenario is such that there is no definite set-up, or pattern for technology uptake in ADCs. What is empirically observed is a random technology transfer and adoption approach. This is a consequence of externally driven ICT4D agenda in DCs at large.

It is in my observation that policy and motivation components of ICT practice would be of great impact for the planned emergence of economic sectors, which have inherent inter-linking characteristics to absorb ICT products and services mutually. The shortfalls in policy for ICT in developing countries have led to two fundamental setbacks in the process of ICT assimilation in DCs.

One is the random adoption of technology which is not tied to any information systems for developmental purposes. Lack of capacity for articulation of ICT related policies in developing countries is lamented about in literature, but not actively addresses in practice. This prolongs ‘dependences’ and waste of efforts in the information society.

The other is a lack of strategies for the utilization of ICT for national development endeavours such as e-governance, e-tax systems, streamlining of applications for business licences via online facilities, etc.

General Opinion

In reasoning about the approach to ICT supported development in poor communities, a few observations can be made:

First, many economic problems of poor communities are rooted in the economic base. Technology cannot be effectively discussed outside of the economic gridlines in which an economic base lies, it cannot only be discussed along the action dimensions. Only certain gridlines have been considered, such as ICT in SMEs, ICT in mobile banking, ICT for accessing knowledge, etc. However, the proportion of the host communities as a whole that are involved in those modes of production, is still not adequately understood as a way of assessing the effectiveness of the expected impacts of technology to communities.

Second, the potentials of ICT, internet, and content for African economies are linked to the issues surrounding other political, economic and cultural aspects of African countries. In reality, the discourse on ICT should embrace backgrounds beyond capital interests to also include social interests where profits are not the fundamental interest. This will pave a way for governments to think broadly in pushing policies for technology uptake in the economies.

Third, in addition to the research community's concerns for 'increasing economic opportunities' (Thompson & Walsham, 2010), other contextual considerations are necessary for the synergies that break the vicious circles of poverty. These include the separated production versus consumption times. In the settings of services economies, production time and information seeking time are not separated. In the actual fact, computers are part of the tools for production. On the contrary, developing economies are dominated by subsistence, small scale economies (Scoones, 2009b). Commodity production is at the centre of activities. The production of services is still not the major component of GDP. This is a scenario where time and place of production are far from the telecentres which are expected to mediate information access.

In general, an emancipatory worldview would propose for inclusive innovations that expose deprived communities to 'core technologies'. In addition, people should be exposed to the knowledge on the sources of their vulnerability to poverty. The people themselves should actively and consciously strive to achieve MDGs.

Having discussed the implications of the empirical practices in applied ICTs, I now proceed to the synthesis of a knowledge outcome of the discussion in section 6.2.

6.2 Knowledge synthesis for the main research question

The expected knowledge outcome of the study's main research question can be summarised as the desire to understand the alternative theoretical and methodological approaches to ICT diffusion processes that might be capable of opening up social development/transformation opportunities in ADCs.

In the progression of the literature review and the conducting of empirical analysis, there emerged a general picture that revealed that the linking of technology to societies and peoples well-being in ADCs is happening via targeting as a means to solve the prevailing 'social needs' and tackle poverty and ill health, open up education opportunities with technological initiatives, etc. The mechanism to achieve these is through the implementation of technological tools in poor communities, that are aimed at advancing them to appropriate informational benefits, in the assumption that those benefits hold the solutions to poverty, illiteracy, poor shelter, gender related oppressions, etc. Technological innovations are conceived and implemented by the development agencies outside the communities themselves, which at the same time happen to own the necessary financial resources, and hence also decision powers. This phenomenon has degenerated into persistent top-down technology impositions in ADCs.

The international 'agency' role-playing is focused at serving the ideas of intervening stakeholders at the international level, as opposed to understanding how the 'agency' would function if it were perceived in the realm of a 'wider global information society'. There is a strong inclination towards the 'push for use' of ICT artefacts to realize development. There is a lack of evidence for 'participated developer' or inclusive development of technology for developing countries from within. Finally, there is little evidence on the appropriate targeting of empowerment of societies to freedoms and functionalities of the CA model.

In principle, the findings derived from empirical themes helped to answer *what* is the understanding, or the perspectives, that drive the motives in applied ICTs with respect to developing countries. I relate this to the conceptual framework I developed in Section 3.4 to say that, the potentials for ICT-driven development in ADCs lie in the ICT-GPT. The processes of technology diffusion should be intra-economies administered to realize the GPT value of ICTs. Necessary social arrangements must be put in place to enhance the local communities ability to drive innovativeness in ICT4D. So why is this not happening? –

because the operationalization of ICT-GPT has not been adequately theorized. This is now argued in Section 6.3.

6.3 The theoretical gap for the operationalization of ICT-GPT diffusion

The exploration of practice was driven by the motive to assess its potential, or opportunities, to foster the diffusion of ICT-GPT in the socio-economic processes of ADCs. There was also a desire to probe practice for the agency's visionary component in applied ICT, that aims at realizing long-term impacts of ICTs with a focus on improving factor productivity for social development in DCs. Finally, the desire was to assess the correspondences in the theoretical and empirical advancement in applied ICT for social development in DCs.

The findings on the observatory constructs that related to ICT-GPT diffusion processes (Sections 6.1.3), have indicated that there is a low level for potential and opportunities, specifically due to the conspicuous lack of 'local vision'-driven efforts in the practices. It is understood from the literature that the way in which the process of technology change is formulated, is at the macro-economic level (Soete & Turner, 1984), which is essentially the philosophical, visionary and policy construction level. This is the level where strategic input in the diffusion processes of technology should be operationalized.

With externally driven missions on technologizing/transforming people and their practices in DCs, there is little room for the local visions in those missions. It was indicated in Section 2.1.3 that operational identities are intrinsic to technology; which means that social innovation is a phenomenon that includes other identifying values according to locality, that are beyond addressing social needs, or having social considerations included in designs (Oosterlaken, 2009b). This is the essence of framing SI as capability for ICT based local functionings, which are undermined in the current understandings of the operationalization of applied ICT for development in Africa's DCs.

There is no evidence, either in literature or in practice found in researching this study, on efforts to consider grounding technology in the contextual economic bases in the processes involving the applied ICT initiatives for development. The worldview that motivates interventions from the supply block is grounded in the consideration of social implications in the interventions. To hook communities in the 'digitally deprived' block, the world information infrastructure is the ultimate goal of the supply block. However, social identities and social value systems need a proper consideration in the efforts to catalyse their successes.

Deductively, social transformation and development are a result of many factors acting together. It may not yield significant results focusing on any in abstract. The ICT project approaches that have targeted one aspect and been unconscious of the others, may be a reason for the claims that social transformation and development have not happened as theorized in literature (Reijswoud, 2009a). This is in comparison to Maturana and Varelas' (1998) contention that "the environment triggers reactions from the human being, yet the environment cannot specify the reactions' the agents have to undertake" (Maturana & Varela, 1998, p.131). It is my imagination in the context of social innovation that, people are not compelled by external technological forces to respond in the way the supply side imagines. The recipient individuals undergo internal biological scrutiny processes either fully conscious or subconsciously before arriving at actions.

To be more precise, there are two discernable gaps in applied ICTs. The first is a methodological gap between artefacts and the socio-economic reality of ADCs; these two are abstracted from each other. The second is a technological trap, where the continuously increasing technological knowledge gap between communities and technology itself, means that before the ADCs can assimilate the core technology of the time, more advanced and complex developments in technology take place.

The situation above is aggravated by the fact that there is not evidence in literature or practice of efforts to consider grounding ADCs in the cores of technological innovations. Accordingly, I would suggest that the onus lies with the ADCs themselves to address the gaps from within their communities through properly grounded innovation promotion initiatives, such as those guided by the theory template I am developing in this study.

6.4 Conclusions

In this chapter I presented a discussion of the findings related to the carrying concepts of the empirical exercise conducted in Chapter Five.

I presented in the Sub-Sections of Section 6.1 that donors and international ICT4D stakeholders are the key role players in ICT4D; they identify the concerns and develop content and values in their own worldviews These in turn shape the implementations of applied ICTs. The stakeholders' focus is in realizing short term outcomes in return for their monetary and other resources value. The MDGs seem to fit this purpose for them. In turn, the MDGs are used as the relating constructs of technology and development in DCs. It is not

among the interests of the international donors to sponsor the assimilation of ICTs in the cores of economic development of ADCs.

The diffusion of ICTs in ADCs was shown to be a non-strategized process, thus lacking potentials to take ICTs to the core economies. If it was strategized, the necessary innovation complementaries, infrastructural inputs, and sectoral emergency could be planned for. The three elements of ICT-GPT diffusion thus hold a key to the pervasiveness of ICTs and to opening-up different spheres of employment opportunities for the poor.

Section 6.2 provided a consolidation of knowledge with respect to the findings and the emanating discussion. The central point in the consolidation was to address the main research question of how to best conceptualize the ICT diffusion processes in the context of ADCs for long-term social development outcomes. I argued against the linking of technology to well-being via targeting as a mechanism to solve the prevailing 'social needs', as this perspective tends to limit the international community of development to attempts to get poor communities to appropriate informational benefits of ICTs, which are assumed to bear solutions to poverty and its derivatives. This comes is at the expense of local capacity building to innovate. I asserted that the solutions to people's poverty in ADCs seems to reside instead within their own innovativeness in mediating ICTs' offered opportunities.

I advanced a perspective that believe may be better than the limited informational focus of ICTs, which situate the economic progress and peoples' well-being in the long-term outcomes of the diffusion processes of ICT. I reasoned that the situated agency should be the key role player in administering the technology diffusion processes in ADCs, for the realization of the GPT value of ICTs. I referred to the conceptual framework in Section 3.4 to suggest that the situated agency needs to look into how the necessary social arrangements are developed and implemented in ADC economies, for the social agents to play a leading role in developing innovations for their own well-being.

In the end I explicated two theoretical gaps that hinder the chances for ICT-GPT to take effect in the economies of ADCs. The first is a methodological gap that is due to artefact-centricity in ICT4D. The applied artefacts and socio-economic reality of ADCs are abstracted from each other. The second is a technological trap, such that the continuously increasing technological knowledge works to persistently widen a gap between deprived communities and technology itself.

Having presented the discussion, I now proceed to devise a tool for addressing some of the underscored methodological gaps, which takes the form of a theory for immersing ICTs in the economies of ADCs. This theory will be informed by the lessons and challenges I identified in Chapters Two and Three of the Literature review, as well as being informed by the empirical knowledge gained in this chapter. Such a theory should work to neutralise the technological trap. This is the task I deal with in the next chapter.

CHAPTER SEVEN: Theory Development

7.0 Introduction

In the previous chapters, I was working on composing an understanding of the scenario of the implementations in applied ICTs for addressing the digital divide and under-development in ADCs. The reviewed literature exposed the conceptions underlying the implemented approaches for diffusing ICTs in societies that fall in the 'deprivation block' of the digital divide. The composition of knowledge was organized around the first three research sub-questions (outlined in Section 1.6), and the empirical observatory dimensions framed in Chapter Five (Section 5.1).

In the course of the literature and empirical exploration, some lessons, challenges and methodological gaps for broadly impacting and deep-down-pushing ICTs in the economies of ADCs, were pinpointed. These were stated in relation to addressing the digital divide in its broad terms, according to the argumention that was advanced in Chapters One and Six, that contested the narrow definition of digital divide (Sections 1.3.5 and 6.1).

The noted lessons from this exercise were fourfold: first, that ICTs have their greatest economic impacts in their contexts of GPTs; second, that GPTs depend on specific features for their effective diffusion in economies; third, that thee dual existence of ICT producer and user industries and a network of sectoral linkages in them, is an important catalyst for the diffusion of GPTs (Section 2.2.3); and fourth, that the presence of situated agency in applied ICTs should be important to facilitate the identification of concerns, and the development of content and values for ICT innovations, in a situated, sense-making, world view.

The identified challenges were basically twofold. One is that ADCs lack a strong industry base for producing, absorbing, and reproducing ICT innovations on the one hand, and supporting innovation processes with resources on the other (Section 2.2.3). The second challenge is the inherent characteristic of the digital divide itself - the technological base in many sectors of ADCs' economies is very low. It is a feature of these economies to be based on light (i.e. low level of intensity and sophistication) innovations. This feature is observable in the means and processes of production, such as the persistent use of poor means of livelihood production tools in agriculture, housing, fishing etc. These two challenges adversely affect the diffusion of ICT-GPT in ADCs. Consequently, the challenges call for specially organized initiatives to make ADCs' economies responsive to, and absorptive of,

ICT productivity impacts. These might include, for example, initiatives to influence ICT enhanced development of human capital in combination with technology itself, and possibilities to enhance the exploitation of other resources such as natural resources, through the use of, or in conjunction with, technology.

Among the empirically identified gaps, there were two which were significantly important - . the methodological gap and the technological knowledge gap. The methodological gap explains the existing scenario where artefacts and socio-economic reality of ADCs stand abstracted from each other. The knowledge gap is actually developing into a technological trap for ADCs, because these countries cannot catch-up with the speed of the continuously increasing technological knowledge world-wide. The knowledge gap keeps widening for that matter.

The lessons, challenges and the two gaps above, prompted the fourth research sub-question which asks: "Should the state in ADCs intervene in the diffusion processes of ICTs to promote cultivated innovation for development?" In this chapter I address this question by first establishing my position as to why I think the State should intervene. Then I explain the need to address the economic base transformation as being a crucial dimension that requires the state's action for cultivated diffusion processes. Afterwards I develop a framework in the name of 'Social Innovation Mediated Social Development Theory", which I think may be useful for directing the efforts in states' interventions to drive the diffusion of ICTs in the core sectors of ADC economies. The argumentation in this chapter is informed by the scholarship of CA.

The rest of the chapter proceeds as follows. Section 7.1 describes the need for the agency of the state to play a role in the diffusion processes of ICTs in ADCs. Section 7.2 outlines the action areas for the state to influence social innovation processes. Section 7.3 addresses the theorization exercise, followed by the chapter conclusions in Section 7.4.

7.1 Need for the agency of the State in ADCs to play a role

It was observed in the course of the literature review that, in the economies in which ICTs' productivity impacts were experienced, the main stakeholders of ICT innovations were industries. Firms in the industries play a key role in promoting ICTs pervasiveness, developing innovation complementaries, and providing resources for the establishment of complementary investment in infrastructure (Section 2.2.2). However, it was also observed that the industry base for ADCs is not strong enough in terms of the density of firms and

possession of investable or diversifiable resources. The question has then to be asked: What are the options for ADCs if this is their inherent scenario?

On the other hand, empirical evidence has provided information on the absence of ADCs inputs (in both technological and policy dimensions) in the initiatives to address the digital divide (Section 6.3). This is attributable to the lack of technological innovation capabilities in these economies. If not strategically addressed, as I argued in Section 6.3, ADCs will fall into the trap of blindly adopting technological advancements taking place elsewhere.

Informed by the concepts of CA, I suggested in Sections 3.3.2 and 3.4 that ADCs need to strive for social innovation capabilities locally. In addition, they need to establish conducive social arrangements, which I labelled as social innovation machineries (SIMs), that should allow for managed innovation establishments such as national innovation platforms (Section 3.4). The question emerging from this proposal is: Who should take up the frontal responsibility to establish such arrangements in the prevailing technological context in ADCs?

To answer the two emergent questions, it is arguably imperative that institutional arrangements should be implemented, and the agency of the state should function to cater for organized diffusion processes of ICTs. The state should also play the role of availing resources to innovation machineries, where the industry is not capable of doing so. Before I could precisely describe how however, I will provide grounds and backing for the idea in the next section.

7.2 Grounds for State Intervention in ICT diffusion processes

The grounds for state intervention in the diffusion processes of ICT in ADCs is attested in two frames. The first reason is the adverse impacts of the current approaches to implementations in applied ICTs as discussed in the previous chapter; specifically, the approaches to the identification of concerns, and the development of content and values for ICT initiatives. The other reason relates to is owning a responsibility for social development. These grounds are elaborated next.

7.2.1 The Adversity of Current Approaches

The likelihood that the contemporary technology-transfer-centred applied ICT will achieve the WSIS's hoped for inclusive world information society, is low. In addition, a continued

dependence on external agency in the extension of ICTs to DCs, acts to generate more dependencies for resources and technological knowledge.

The reason for the above-mentioned assertion is that, the current arrangements in applied ICT have inherent marginalization effects over the communities that do not own technological know-how. Technological arrangements act to further prolong the exclusion of ADCs, as the technologies themselves continue to become more advanced and complex overtime. There is no demonstrated effort for instance, to ground the knowledge of ICT in local contexts beyond '*pushing for use*' at the level of individuals. ADCs need to participate in core innovations to afford technological assimilation in the socio-economic contexts of development.

7.2.2 The Role of the State in Social Development

Social theories inform that social development entails transition in a societal totality. In relation to technology, technological advancements in a society have an effect of causing large scale definite episodical sequences of change that affect the main institutions of a society (Giddens, 2009). In the process of being impacted upon, the institutions undergo adjustments in their structures and processes to let them cope and take advantage of advancements.

Development begins to take effect when the key institutional transformations are accomplished as an initial condition (Giddens, 2009). Institutional transformations could involve the enhancement of people's opportunities to better practice in social-economic and political spheres. This view is shared by Zheng and Walsham (2008) as well, when they apply Sen's capability approach in their work. Furthermore, institutional transformation would involve a range of role playing and strategizing of all the tools available for social functionings within the social units as individuals or groups.

In the deployment of the idea of the 'agency of the state', as expressed by Aristotle (Burnet, 1967), if it is the problem of the state to realize "the desirable ends of the social activities" (Burnet, 1967), then the government policies relating to technology in DCs have to be geared towards improving institutional conditions for social change with respect to technology. In essence, in the connotation of 'desired ends', the conceptual decisions as articulated by Giddens (2009), get impacted upon by the presumed social changes desired by the people, where the people as a body is represented by the state. The state functions as the 'agent' of the people, which is an important aspect for strategizing technological interventions in ICT for development. It means in effect that, in their role playing on behalf of their societies, the

envisioned states (especially in developing countries), through their think tanks, are capable of influencing social change by using working strategies that are motivated by the desire to feature a significant presence in the technology arena.

The agency of the state is relevant in many instances, including setting up ideological states of mind for a shared worldview of communities. A common worldview should sit at the base of social choices for the people to justify the allocation of resources; for instance to SIMs, and commitment of efforts to exploiting the ICTs in their different formats. Ideologies are means for the perceived value of any technological innovation.

In the other words, the ways in which ICTs diffuse in economies stand to be determined by the people and their social contexts, according to their beliefs and motivating ideologies, to a greater extent. For example, advanced communities have their particular ideological identities which every community member strives for versus the rest of the world. In other words, the outcome of a technological innovation cannot be precisely predetermined by one block (like the supply side or the developers of ICTs in some instances) for the other recipient block (Gigler, 2004; Reijswoud, 2009b). In Bala's (2010) observations, it is not appropriate to regard one block of the world as one 'working out development' for another or others, andn regard the other block as the 'receivers'.

Thus, in the absence of clearly stipulated ideologies at the micro level, the technological innovative missions conceived in the community of practice may fail to yield expected results for the global information society. In essence, where explicit ideologies on matters of social development are not specified, the impact can be experienced in the allocation of resources (human and financial) at the national level among competing wants, which may not be reinforcing the international demands as set by WSIS. Again, ideology-policy-missions are supposed to move in a coherent manner as they feed into each other. Ideologies guide the formulation of policies and in turn the missions for accomplishment of undertakings.

It is unlikely that the relationship between technology and society is uniform universally. Human agents have choices in their actions which depend on a somewhat complex network of factors to arrive at. These may include elements such as economic and social preferences (for example education for children, or health for women, instead of large herds of cattle for prestige in some of the African communities). They may also include what the choice maker is capable of doing within the limitations of other hindering factors. In turn, choices are not free of social relations. Sen's proposition of development as 'extending freedoms of agents'

can be implied here to mean the extension of choice horizons that an individual can enjoy within a larger societal setting. Accordingly, the target of technology should be to impact on the extension of the individuals' choice boundaries in a social realm.

In summary, it is in my assertion that the states in Africa should have an ideology-based agenda about technology in order to facilitate a careful planning of expected outcomes, and drive the initiatives; instead of having the international agencies drive the initiatives for the technologization of their digitally deprived communities.

Having defended the position of the state in the developmental processes of societies in general, my next task is to explicate why the consideration of the existing economic base is essential in the ICTs uptake agenda in ADCs. This task is undertaken in the next section.

7.3 The essence of the economic base in the diffusion of ICTs

To keep the focus of this study on cultivating for a broad front diffusion of ICTs for addressing the digital divide, the economic base factor is discussed in three gridlines or parameters: (1) The economic base scenarios in relation to technology uptake; (2) The innovativeness and technology diffusion in the States' mediation; and (3) The essence of institutions in economic transformations.

7.3.1 The economic base scenarios in relation to technology uptake

The nature of an economic base of a country may render it inabsorptive of advanced technologies, due to some factors such as the level and type of tools of production and the production relations that prevail. This is termed 'economic resistance to technology' in the current study for simplicity, and it is essentially a structural issue of African economies, according to Bryceson (1999, 2009).

The relationship between ICT and social development in developing economies is not a one-to-one, direct one, as would be the case in corporate dominated economies. For instance, where e-commerce, e-B2B, and/or e-business are relevant modes of production, the place of ICT is significantly certain. It is more difficult to unleash the potential of technology to drive the desirable social paradigmatic transformations, where the economic base is at subsistence level, dominated by small holder undertakings in agriculture, small scale entrepreneurship, or armature mining (Sections 2.2.3 & 6.1.1), such as in DCs. Scenarios of the latter kind require analytical tools equipped with individual-to-social-context probing lenses, to detect the

signals of development impacts of technology. They also require thinkers in ICT to widen thinking horizons to accommodate realities of the poor economies of ADC type.

The need to recognize the prevalent economic characteristics of African economies in the conception of technological interventions cannot be overemphasized. There are propositions in literature for example, on how ICT could be of benefit to small holder farmers in Africa (Kamau, Guthiga, & Kavulya, 2010). Kamau and colleagues claim that the effect of information to small-scale farmers could be to enable them to fetch 'fair prices' for their produce, thus diminishing the abuse of information asymmetry created by middlemen who use their marketing knowledge to exploit small-holder farmers. Research in development informatics "should point at pathways that create understanding on *how to leapfrog development* that can take developing economies to the same levels of economic empowerment as developed ones", Kamau *et al.* (2010, p.4) claim.

A similar input obtains from Metfula when writing on the Swaziland mobile telecommunications scenario (Metfula, 2010). According to the presenter, ICT4D initiatives in Africa have persistently lacked "sustainability, scalability, evaluation and ... local relevance and content" (Metfula, 2010, p.2). On the other hand, Metfula posit that mobile phone technology is an innovation currently underpinned as playing a crucial role in 'helping' Africa as a developing world to '*quickly transcend'* the poverty line to prosperity. The technology is said to provide connectivity and mobility availing vital information (on what? presumably prices and markets) to entrepreneurs in the developing world. Unfortunately, this observation is exclusive of the majority of the producer force if the economic base and production modes of developing countries are carefully considered. The volume of entrepreneurship is low while market search for farm produce is not so significant.

Following the scholarship of 'production theory' in economics (Cobb & Douglas, 1928; Kurz & Salvadori, 1997), to 'leapfrog' development there must be a phenomenal shift in the economic base where ICTs should act as the shift agent. This means productivity of resources will be at a higher level than before the deployment of an innovation, as a result of complementarities and unlocking of productivity potentials of resources; this is the technological progress that enhances "the combining of factors of production in more efficient ways, while applying new knowledge" (World Bank, 2013). Figure 7-1 illustrates this argument. Assuming an economy producing just two commodities, Cx and Cy for simplicity; the vertical and horizontal axes represent quantities of Cx and Cy that can be produced by combining two factors of production, X and Y.

For further simplicity it is assumed that the innovation impacts equally on the production efficiency of the two factors of production X and Y. This assumption works to temporarily fix the outcomes of non-proportionate impacts of the innovation on the factors of production. The effect of this assumption is to have the production possibility frontier (PPF) curve shifting outward to the right an equal distance from both Cx and Cy axes (The figure is not drawn to scale however).

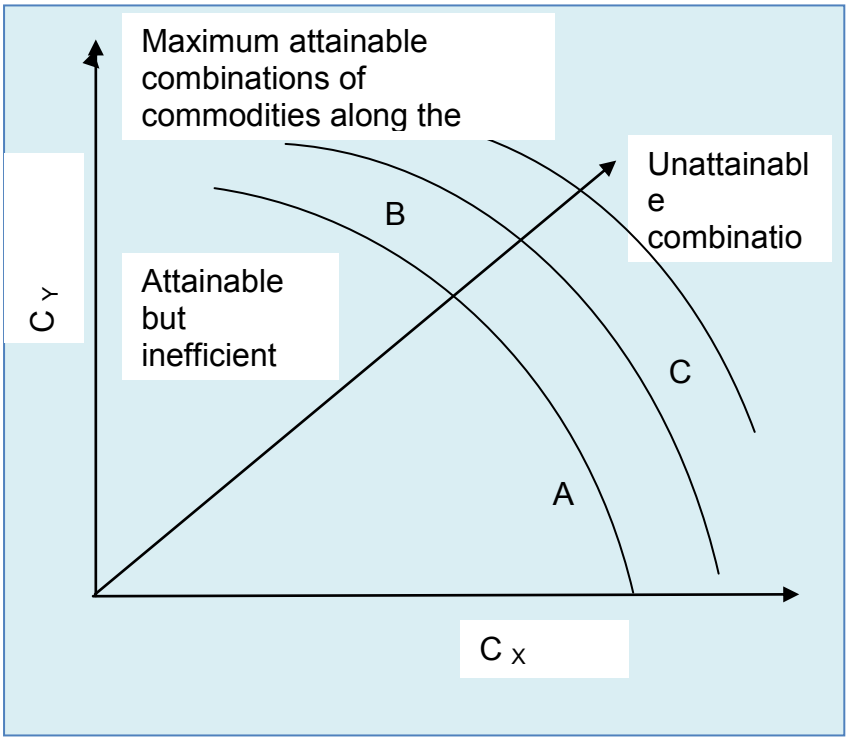


Figure 7- 1 The ICT Enhanced Shift in the Production Possibility Frontier

In the figure, A is a curve known to represent different combinations of commodities Cx and Cy (which could be measured in quantities or monetary value). Its position on the matrix signifies the maximum amounts of Cx and Cy that can be achieved, when the resources X and Y are fully utilized at the available level of technology.

Consider the initial state to be where a community can achieve only a basket of goods represented by the curve A (by value). With value-adding, interventive efforts to the economy as a whole, the productivity of the community's assets is enhanced to a higher value level along the shift path (represented by the arrow from the origin). As technology advances, the curve shifts to positions B, C, and so on.

The value concept is used as a reference in order to acknowledge two types of value addition. In the first case is a depiction of enhanced better prices due to exposition to new markets via technological innovations. In this case the same volume of commodities yields a higher monetary value than before. The second possibility is that of value emanating from an increase in the volume of commodity goods deriving from empowerment or better farming techniques as a result of technology innovation mediation. For instance, as a product of innovation, new knowledge elements may emerge, which diffuse with existing scientific processes to translate into new products and production processes (Hall, Bockett, Taylor, Sivamohan, & Clark, 2001). In other words, if an innovation works to improve the productivity of resources, it is possible to achieve a larger basket of commodity combination with the same amount of resources input.

That said, there is a need to have ICT service models that are not modelled against the advanced corporate world. In that world, the known market and price variables are more relevant, than is the case for the less organized economies of developing countries. Africa needs ICT models that, for instance, include considerations for increasing productivity at the base of the African economies, such as farming, animal husbandry, fisheries, etc., or that can bring about economic base structural adjustments.

The argument above follows from the observation that some of the projected links of ICTs to development in research tend to contradict the developments in literature. For instance, the ideas of Kamau (2010) and Metfula (2010) are true in theory but pragmatically require more inputs. It is important to understand that, considered in context, small holder and peasant farmers (who are the dominant majority in poor countries) hold no bank accounts; and they tend to reserve their farm produce as a form of 'savings' for emergence needs. When the need for cash arises, there is in many cases a small gap between the decision to sell and actual transactions, leaving little room for marketing because of the pressure of 'emergencies' (such as taking a family member to hospital, paying for school contributions, etc.). Such a scenario does not provide ample space for Internet mediated marketing. In a nutshell then, for interventionist initiatives to be successful in DCs, the initiatives have to forge links with the contextual economic conditions.

It is an open fact that a variety of factors have contributed to the state of poverty in many ADCs, such as the context of urban-rural economic relations, lack of physical infrastructure (land and water) for movement and transportation, all of which present a serious constraint to development related to ICTs and their promised opportunities. Transportation difficulties

escalate transportation costs. As a consequence, farmers get very low prices on their farm produce, while the same these products are sold at an inflationary price to consumers in urban areas. Conversely, goods from urban places, which happen to be business hubs, reach the village dwellers at high prices due to high transport cost margins. Given the poor production tools that the village dwellers use, such as the 'hand hoe' for tilling the land, or 'peddle canoes' for fishing, there is a limit to how much people can produce. In the end, at their maximum efforts what they can produce is just not enough for subsistence. In the long run they cannot afford medication to cure malaria and other ailments, pay school fees for their children, and etc. The vicious circle then sets in (Amexo, Tolhurst, Barnish, & Bates, 2004; Piot, Greener, & Russell, 2007).

Another scenario is when localities are suppressed to remain at quasi-local market saturation level, due to lack of physical road networks to markets outside, as well as the existence of comparative disadvantages. In the competitive free market economy that the infrastructurally disadvantaged communities face, they fail to sell their produce because traders just choose to source from more easily reached places. This is a setback to even mobile phones in this kind of scenario. People may know where to get better prices, yet fail to benefit from that information resource due to lack of physical access geographically.

The message I am aiming at disseminating from the discussion above is the concerns identified in applied ICTs need to be conceived within the surroundings of economic base realities. Such realities are better known from within, by the people within ADC communities. That is the situated agency.

7.3.2 Innovativeness and technology diffusion in the mediation of the State

The World Bank Group (World Bank, 2013) has underscored creativity, foresight, and risk taking as the "key elements of any innovative process". In turn, innovations address needs or aspirations (Chacko, 2005b; G8, 2000b). Harrison and colleagues (2009) posit that "beyond business firms, innovation is an important phenomenon in the global society" (p.7). It is through innovations that the innovative in communities such as India, Brazil and China have achieved phenomenal developments in the software industry (Arora, Arunachalam, Asundi, & Fernandes, 2001; Arora & Gambardella, 2006; Kumar, 2001). Innovation is a dimension of technology that is highly influential in instantiating technology in the realm of development processes (Avgerou, 1998, 2003; Corea, 2000; Gault, 2010). Yet, potentially impactful, major innovations have to be planned for, and coordinated to exploit their advancements and

cumulativeness in sectors (Castellacci, 2008b) for their short, medium, and long-term socio-economic performances (Castellacci, 2008b; Cette, Mairesse, & Kocoglu, 2005b).

Innovation is a collective social endeavour, a collaborative process in which the economic units such as sectors depend on each other for the expertise, goods, and services in a wide social constituency of workforce, suppliers, consumers, institutions, training bodies etc. (Ainamo & Docent, 2007b). Innovativeness is an arm by which societies and individuals achieve development. The literature proposes that the efforts for social transformation have to focus on empowering people individually or collectively to make their own choices, instead of focusing on "pre-defined outcomes" (Gigler, 2004; Sæbø & Furuholt, 2013; Sen, 1999). The empowerment of individuals or societies is relevant for strengthening their inherent abilities to influence their strategic life choice, which is an enhancement for the application of CA in the modelling for SI. In reality, technological intervention in DCs will arguably be effective in influencing social development only if people in those places are empowered to work for themselves. This raises the question of the role of institutions in achieving it.

7.3.3 The role of institutions in socio-economic transformations

By definition, an institution is a social structure that gives lines of action or orientations to organizations or individuals, while controlling and constraining them (Mignerat & Rivard, 2005). According to Mignerat and Rivard (2005), institutions are able to influence individuals or groups through institutional pressure empowered by norms, coercion (acting on legal basis) or representation. In the works of Hall, Bockett, Taylor, Sivamohan and Clark (Hall et al., 2001b), possible ontological ambiguities about the terminology 'institution' are highlighted. This makes it important to clarify the working conception of the term used in this study. According to Hall and colleagues (2001), there are two levels of understanding of 'institution' as a concept. The first is where the term is used to refer to 'cultural traits' as social 'rules' and 'norms,' for example the institution of marriage. The other is to use the term 'institution' to refer to established organizations "that have attained special status or legitimacy" (Hall et al., 2001, p 784). For this study it is the latter definition that is applicable.

Literature on development economics describes institutions as an important factor for economic growth in a broad sense (Bulte, Damania, & Deacon, 2005; Shirley, 2008). Scholars of economics posit for instance, that a country's governance institutions can affect the contribution of economic resources to economic growth. Bulte and colleagues (2005)

extend on the idea that there is a direct link between the quality of institutions, economic performance, and the human development index (HDI) of a country. It can be inferred from Shirley (2008) that 'quality institutions' means 'good and well established' institutions. Similarly, the deliverable functionings in the mediation of the proposed SIM and a societal capability SI in the perspectives of HDI (Hamel, 2010b) should be dependent on the institutional capacities in the communities of relevance.

Institutions are fundamental to nurturing and supporting policies and practices that foster the flow of ideas, values, capital, and cross-sector initiatives. Institutions have potential to drive innovations in the public or private domains under different motivations, such as competition, profits, search for knowledge, or social role playing. Institutions as carriers of opinion, are thought to be able to fill the gap of the 'sense of ownership' (Materu-Behitsa & Diyamett, 2010) as a driver to progress the implementation processes of ICT interventive initiatives. Serious consequences are noted when the donating partners leave the projects behind or withdraw their funding. In most cases the projects fail to proceed.

Institutions are a factor for social change, which means they need strategic underpinning, for instance in the fostering of the diffusion of ICT-GPT for social transformation. For proper functioning, institutions need resources like financial and human capital (Gillwald & Stork, 2007). The ICT Benchmarking Report for the EAC ((2009) cited in Materu-Behitsa & Diyamett (2010) complains for instance that despite the sound articulation of ICT policies in DCs, the 'implementation process lacks ownership' while there is no articulation on the institutional and governance structures.

Institutional role-playing as a factor for social change is well operationalized in CA for human development. The CA asks for the existence of 'institutional arrangements' to facilitate the promotion of health, education, gender emancipation, democratic practices and political participation, to enhance functionings and capabilities among communities. In other words, institutions play the role of channelling intervention initiatives to the relevant sectors of economies for desired impacts.

The defence of the case for state intervention in the processes of ICT diffusion in ADCs in this study was aimed at exposing an alternative way for filling the space left open by the absence of strong industry bases to host the processes. State intervention was advanced as a

viable option for circumventing the observed contextual challenges of ADCs, in which the long-term economic impacts of ICTs cannot emerge if not strategically dealt with.

In the course of providing grounds for the argument for state intervention, the assessment of the economic, innovativeness, and institutional conditions necessary for the diffusion of ICTs in economies was highlighted. At this juncture, a platform has been set for theory development as the ultimate product of the chapter, addressing the '*how*' part (Section 7.1) of the research sub-question: "*Should the state intervene?*" (Section 1.6). I proceed to the theory development exercise in the next section.

7.4 Theory Development

In the theory development, I draw from the empirical evidences suggesting that the communities in developing countries may continue to fail to cope with technology in terms of identifying their own concerns, and developing their own ICT concepts. The concern is that communities will continue to fall into a trap of technological advancements, where before they can be able to adopt the cores of existing technologies, new more advanced and complex developments in technology occur. In the end, the technological knowledge gap and digital divide increases, because the drivers of ICT initiatives are grounded in technology transfer, and the initiatives are ex-community masterminded and almost entirely dependent on foreign sponsorship.

In my construction, the theory I am developing is intended to be an interventive contribution to practice in ADCs. It is intended to work as a reference guide in the contemplation of addressing the digital divide in applied ICT. Accordingly the focus is on developing a theoretical tool for understanding the diffusion processes of ICTs in the context of GPTs.

The projected focus calls for an understanding of the properties inherent in the diffusion of GPTs as a prerequisite to any planned interventions. The theory development exercise is conducted at three levels. Level one is the study of the patterns the GPTs go through in their diffusion processes. Level two is modelling for 'agency of the state'-driven enhancements in the diffusion processes of ICT-GPTs, and level three is a consolidation for social innovation mediated social development (SIMSD).

7.4.1 Patterns of technology diffusion

Understanding the trajectory patterns of technology diffusion is a prerequisite for making policies, decisions, and plans in technology management. Trajectory patterns mean

systematic variation in any significant aspect of a phenomenon. Understanding of trajectories is a basic knowledge requirement for planning initiatives for the management of technology uptake. No and Park (2010) contribute to this idea by positing that well outlined technological trajectories can be used as "'predictive tools for the determinants of innovative performance" (No and Park, 2010, p.64). Practically, the patterned view of the evolution of technology has helped to provide information on the key characteristics in various economies, industries, or sectors that foster technological diffusion (Malerba & Orsenigo, 1997; Pohjola, 2003).

In a study on the patterns of technology change involving 2000 innovations in Britain over a period between 1945 and 1979, Pavitt (2000) was able to identify observable patterns in the diffusion processes of ICTs using econometric tools. A patterned view was also observable in other studies which confirmed that technological knowledge is cumulative, as well as accompanied with short-to-medium, and medium-to-long term economic and social gains as the diffusion of technological innovations take place (Cette, Mairesse, & Kocoglu, 2005; Dosi, 1982).

Deriving from literature on the revolutionary nature of ICT (David & Wright, 1999), three major stages of technology diffusion processes can be identified for practical purposes.

The first stage is the "*momentous invention*", according to Bresnaham & Trajtenberg (1995, p.84). This is an instance of a technology, emerging from within, or being introduced from outside, attracting significant attention in the economy.

The second stage involves the phase of developing *innovation complementaries*. This is a stage in the process of technology diffusion, where the firms divert resources from existing objectives, or make new allocations to the development of complementary inputs. The motive is to take advantage of the GPT characteristics of a new technology (Helpman & Trajtenberg, 1996).

The third stage is the technical change in the user sectors (Helpman & Trajtenberg, 1996), which happens as a result of having enough complementary inputs developed in those sectors. This is the stage at which significant innovations emerge. The best description for 'significant innovations' is provided by Pavitt (1984) who defines these as, "the visible manifestations of deeper processes involving incremental and social innovations" (Pavitt, 1984, p.344). Essentially, the second and third stages are characteristics through which pervasiveness develops (Jovanovic & Rousseau, 2005). At the third stage, sustainable,

pervasive, and productivity gains with GPT begin to manifest significantly (Helpman & Trajtenberg, 1996). Accordingly, pervasiveness and linkages in the process of technology diffusion, develop along the same lines of the sectors in which complementary inputs develop.

Practically, the countries that drive technological innovation have experienced the outlined stages of technology development in the diffusion processes (Cette et al., 2005; Jalava & Pohjola, 2007; No & Park, 2010; Rohman, 2013). In all the stages, the driving force is continuous innovativeness. Technology deepening and factor productivity essentially develop at the second and third stages of innovation assimilation.

The knowledge of the patterned diffusion of GPTs informs of what I will call 'the critical identifiers of the stages'. The first stage is identified by the emergence of, or an introduction of a new innovation. The second stage is critically identified by the emergence of complementary innovations and complementary investments. The third stage is critically identified by the assimilation significances. The knowledge of patterned diffusion and critical identifiers will be used in the subsequent sections on theory framework modelling (7.4.2) and theory framework underpinning (7.4.3). The next section is on theory framework modelling.

7.4.2 Theory Framework modelling

The modelling that follows is for state intervened ICT diffusion processes. In the modelling activity, I first recall the argumentation put forward in Section 2.1, and thereafter in Section 3.1, namely that DCs should be perceived as potential innovators, and the situated agency should strive to enhance capabilities for that. It was also suggested that the states should play an active role to enhance the environmental and social endowment factors in innovative functionings; in the other words, the state should extend freedom boundaries for innovation. I used this construct as the baseline argument for the study's conceptual framework (outlined in Section 3.4). Specifically I aimed at operationalizing the SIM construct for social arrangements that can unlock innovative functionings in ADC communities, with a focus in promoting economic growth impacts of applied ICTs.

In modelling the theory framework, I am drawing on the lessons gained in literature and empirical observations to inform the motivating constructs for the model. These are identified as per the observations and findings underpinned in Section 6.1.3 on the 'guarantees for the diffusion of ICT-GPT'. On this basis, the proposition that is made is to let the communities in ADCs: (1) aim at promoting the GPT functionings of ICTs; (2) strive to enhance the

emergence of the necessary conditions for the diffusion of ICT-GPT in the implementations of applied ICTs; and (3) strive to enhance the emergence of economic sectors with ICT-driven inter-relationships in the mix of the diffusion of ICTs. The first construct is about enhancing ICTs to influence labour and capital factor productivity for economic growth (Section 2.2.2). The second involves creating the conditions for the emergence of innovation complements and availability of resources for complementary investments in infrastructure. The third is about creating conditions for availability of incentives leading to the emergence of economic sectors with capabilities to assimilate innovations from each other, for example software development sector versus automated agricultural produce processing lines.

With the developed motivating constructs in the background, I have devised a diagrammatical theory development framework in Figure 7-2 below. For simplicity I refer to the state intervened diffusion process as 'an organized diffusion process' hereonafter. In the figure there are six main dimensions, labelled 1-6. The six dimensions altogether define my construction of Social Innovation (described in sections 1.1.3; 3.3.2; and 3.4). In Figure 7.2, SI is placed as 'level 0', to mean that all other elements of the framework are in its constituency. The dimensions are described as follows:

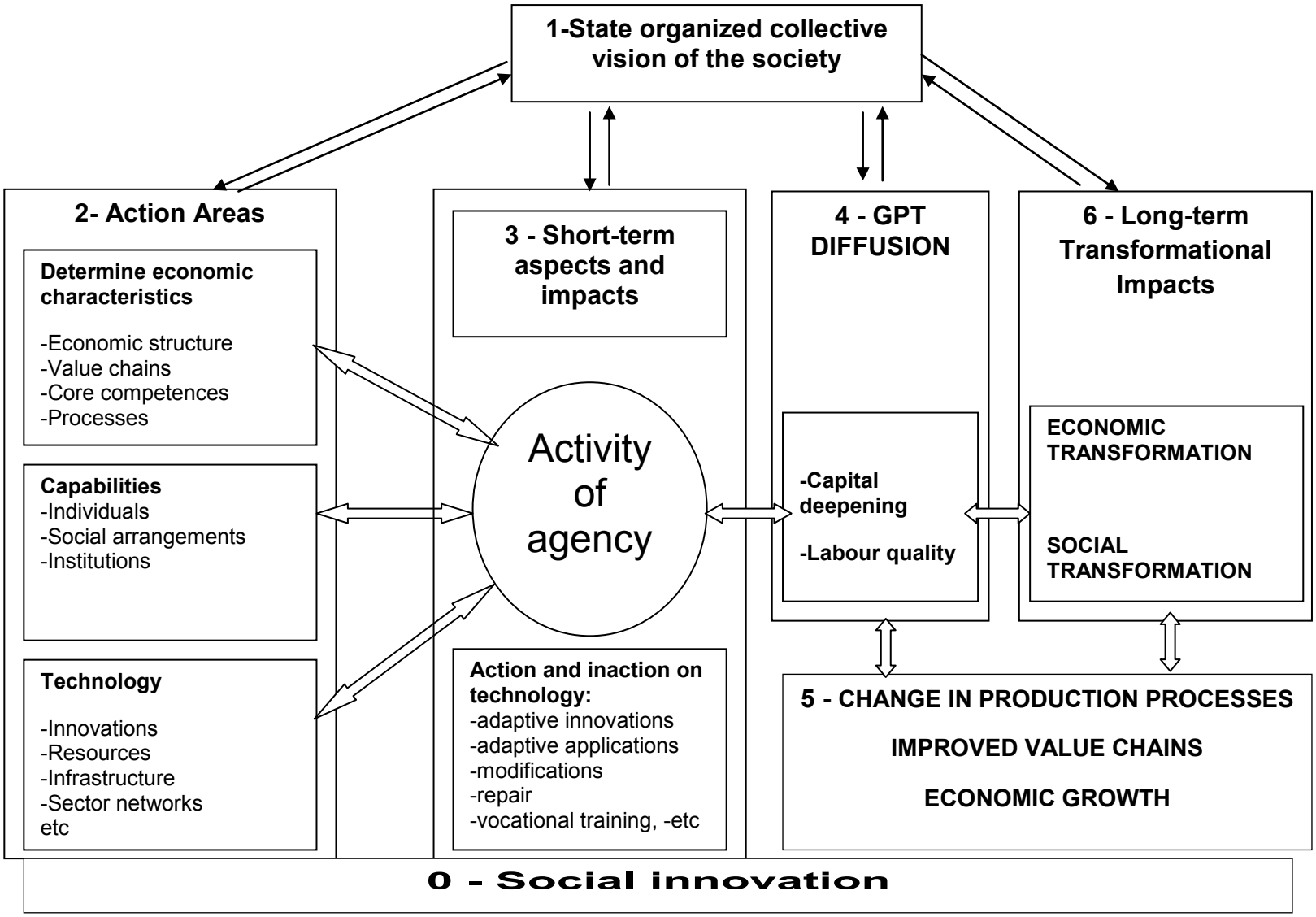
Dimension 1 (State organised collective vision of the society) depicts the role of the state to organize visions on technology, development and social transformation, in its representation of the society (Section 7.2).

Dimension 2 (Action areas) refers to the areas of attention requiring the state's action. For instance, the state should be aware of the economic conditions, the available capabilities, and the technology environment, so that it can act to align these with the requirements for the deep and extended diffusion of ICTs.

Dimension 3 (Short-term aspects and impacts) is an activity area. It is a projection of the individuals' and institutions' agency role played in innovating and propagating innovations. It is a demonstration area of the innovation capabilities. The realization of innovation impacts is achieved in the short term, while other impacts have implications for the long-term outcomes.

Dimension 4 (GPT diffusion) is a depiction of the outcome of the processes and activity that take place in Dimension 3. As people engage technology in different aspects, capital deepening develops, quality of labour gets modified, and technology sinks to the cores of economic operations whose impacts are realised in Dimension 5.

Figure 7- 2 Theory Development Framework



Dimension 5 (Change in production processes, improved value chains, economic growth) projects the macro-level manifestations of the impacts of Dimension 4. They are an outcome of technology-enhanced factor productivity. Improved production processes and improved economic value chains lead to economic growth. In turn, economic growth is a driver for long-term, sustainable, social and economic transformation of **Dimension 6 (Long-term transformational impacts).**

I stated at the beginning of the section that the framework under construction could be a guiding tool of practice in applied ICTs. Accordingly, the next stage is to underpin the framework in operations.

7.4.3. Theory Framework Underpinning

To operationalize the framework I developed in Section 7.4.2, I refer here to the empirical literature that identified patterns and stages of technology diffusion, discussed in Section 7.4.1. The essence is that, for the state to effectively organize for high impact technology diffusion, it should have base information on the techno-diffusion scenario, or on the state of the critical identifiers of the stages (developed in Section 7.4.1). This is an input that should function to identify the technological concerns, and development of content and values for the state organized diffusion processes.

For practical purposes, I devise a tool for the prior techno-diffusion scenario assessment for identifying the starting point or the relevant 'concerns' beforehand. The tool is presented in Figure 7-3. The tool is a 'spider-diagram' for multi-dimensional perspectives in the process of assessment.

The 'spider-diagram' tool works by first specifying certain 'critical identifier'-informed criteria. In the figure, the ICT innovation, social arrangements, innovative complementaries, and complementary inputs, emanate from the stages one and two critical identifiers. The rest are informed by stage three. The scores (which are arbitrarily determined in Figure 7-3 for purposes of illustration) are obtainable from technical surveys, using Likert scale tools. The Core ICT Indicators Manual (The Partnership on Measuring ICT for Development, 2010) is useful at this stage. It is used to get the specific variables for each criterion. The observations against the criteria are plotted to generate the internal polygon, which is a visual aid for the status of the variables. The polygon is supposed to be indicative of the action areas for intervention, such as where to do what.

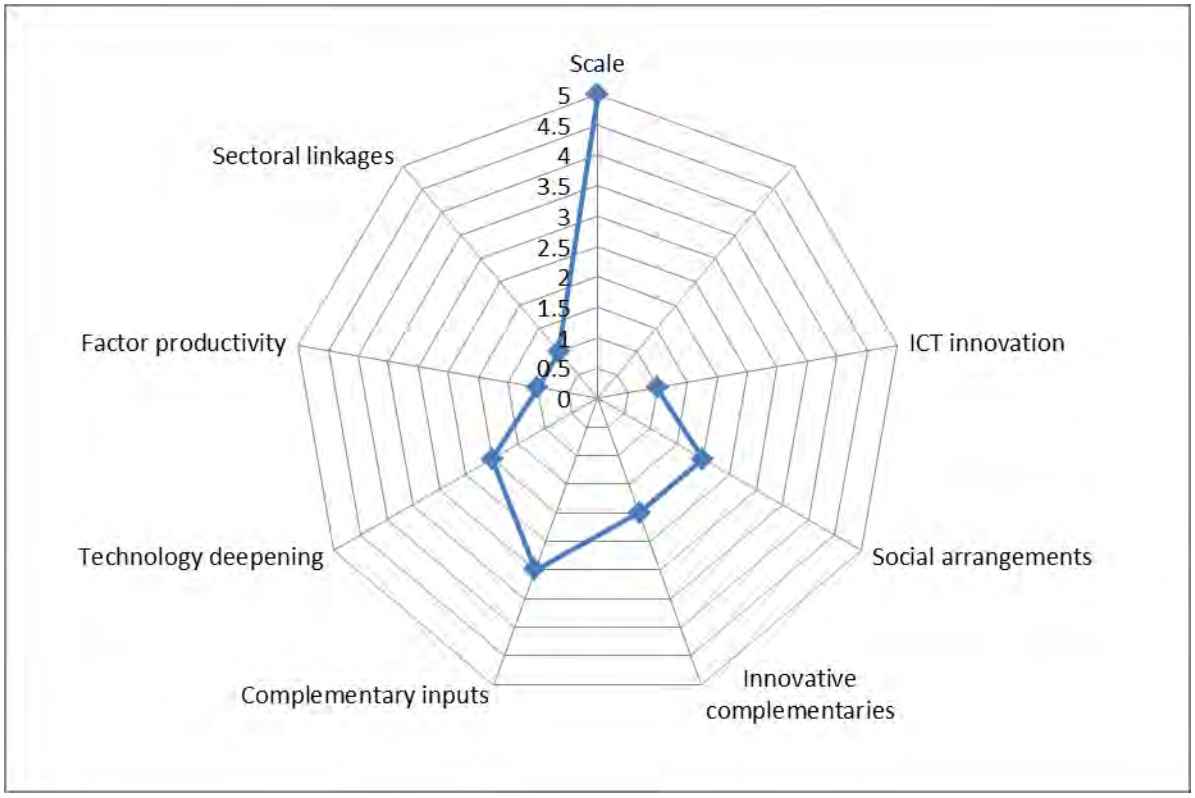


Figure 7- 3 A Spider-diagram tool in the drafting of organized ICT diffusion process

Thus for example, the score on ICT innovation would provide an indication of the rate of emergence of ICT -elated innovations. An innovating society will have a favourable score on this. For social arrangements, the tool is to test for the presence of the necessary social arrangements (policies, financial resources guarantees, market protection etc.) for innovations to emerge and thrive and so on.

The tool also helps as a pointer to the areas of strength and weakness in the efforts for social development. The areas that attract low scores on the specified variables should be areas of incompetence and vice versa. The advantage of the tool is that it provides a visual aid for viewing the status of critical identifiers in a single plane through the use of an easy to understand polygon.

7.4.4 Social Innovation Mediated Social Development (SIMSD)

In the progression of my argumentation in this study on the dimension of social arrangements for the diffusion process of ICT, I advanced a perspective which does not blame the diffusion failure on behavioural aspects such as technology acceptance, perceptions, skills or knowledge of ‘users’ (Section 2.1).

In advancing this perspective, I have persistently promoted the idea of developing SI as a societal capability, where social arrangements of the SIM kind are positioned for long-term impacts of ICTs (Section 3.4).

An addition can be made to the above perspectives that ICTs-backed social transformation for development is possible in a total sectoral inclusion planned arrangement of the functionings of socio-economic actors. In that arrangement, SI will comprise a basic capability for effective appropriation of ICTs' enhanced opportunities. I use the term 'social innovation mediated social development' (SIMSD) as a carrier of that notion.

I position SIMSD as a macro-level medium in which societies should restructure themselves to adapt their existence to externally or internally generated impacts. Contrary to what is observed in business, where the impetus for diffusion of technology is said to be built on cost factors, customer services, or strategic advantage over competition; SIMSD is the action area for social development where making profits is not explicitly the driving force. In this perspective, SIMSD is framed as a medium in which individuals or social units as agents of societies, conceive ideas over their concerns. This is only the beginning of innovation processes in certain threads of socio-technical planes. In those processes, the agents proceed to challenge their innovative capabilities to develop concepts, content and values for implementable measures for their identified concerns.

In the proposed notion of SIMSD, I advance the conception that efforts in any block, be it 'recipient' or 'supplier' in applied ICTs, should target the transformation of the economic base in developing countries, instead of targeting the transformation of the people. It should aim to unlock local resources instead of targeting local needs of societies.

SIMSDs stipulate that SI should enhance cultivated functionings in the local processes to breed inward sustainable innovators who can brainstorm on how to best use technology in their local conditions. Equally important, technology should be considered in broad perspectives of development, thus a broad approach to technology deployment is advanced. This is a perspective that recognizes technology as a form of asset for well-being in CA. Its opportunities on offer can be freely chosen from for deployment in human development endeavours.

7.5 Evaluation of the Theorization Exercise

In the process of the theory building at hand, the constructs, or 'basic theory building blocks' were charted out of the following: the study's conceptual framework (Section 3.4); the empirical lessons gained on the diffusion processes of GPTs in other places; and the challenges for the

diffusion of ICTs identified from the empirical component of this study (Section 6.1) as accorded by Gregor and Jones (2007). Whetten's (1989) outlined structural composition of theory qualifiers is used to cross-check for completeness of the exercise. According to Whetten (1989) a complete theory has to feature four components as detailed in Section 4.4: the *what*; the *how*, the *why*, and the *who, where, when*. Table 7-1 is a summarising description of the components according to Whetten (1989).

Table 7- 1Theory Modelling Grid (Summarised from Whetten (1989, pp.490-492)

Element	Description
What	Which factors (variables, constructs, concepts) logically should be considered as part of the explanation of the social or individual phenomena of interest?
How	Having identified a set of factors, the next question is, How are they related?
Why	What are the underlying psychological, economic, or social dynamics that justify the selection of factors and the proposed causal relationships?
Who, Where, When.	These temporal and contextual factors set the boundaries of generalizability. They constitute the range of the theory.

What – The *what* is about explicating, or identifying the constructs, operationable variables, or descriptive terms (concepts) of the phenomenon at hand. In this theorization exercise, the concerns were underscored through the lessons and the challenges for ICT diffusion (Sections 2.2.2 & 2.2.3; Section 6.1) and the SI conceptual framework (Section 3.4).

How - The *how* "involves using arrows to connect the boxes" (Whetten, 1989, p.491) to explicate patterns. This aspect is answered by the theory framework modelling activity in Section 7.4.2.

Why – The *why* is the expression of the rationale for the identified parameters (constructs, variables and concepts) and the established relationships among them. The rationale for the current theorization is that the technological future of the ADCs lies within the ADCs, and not from without. The digital divide should be broadly tackled beyond addressing MDGs item-by-item, to incorporate immersing ICT-GPT to the cores of ADCs' economies for long-term economic growth. This was explicated in Sections 1.3.5; 2.1.1 & 2.2.3.

Who, Where, When – This is about setting the "range of the theory" (Whetten, 1989, p.492) in terms of society, context and time horizon. In the premises of this study, the theory tool is

defined for the economic and social agents in ADCs, in the contexts of technologically deprived economies and the contemporary state of affairs regarding the uptake of technology. The study was explicitly descriptive of the roles of individuals, the state, and other institutions; and the expectations thereof in the enhancement of technology diffusion in ADCs.

7.6 Conclusions

The main task in this chapter was to address the fourth research sub-question which asks: "Should the State intervene in the diffusion processes of ICTs in ADCs?" An argument for the state to intervene was advanced. The cited reasons were that ADCs need a functional intervention to fill the gap caused by the lack of a strong base of resourceful firms to host the firm-driven emergence of innovation complementaries, investments, and inter-sectoral linkages for the production and use of ICTs. Furtheremre, the state is needed as a source of visionary, policy and institutional instruments for the necessary social arrangements in the diffusion processes of GPT perspectives of ICTs.

It was pointed out in the defence for state intervention, that specialized efforts are needed in ADCs to enhance the countries to assume a production role of ICTs. This is in place of being persistently branded as potential 'users' only. Otherwise they risk falling into the trap of vainly trying to keep up with ever increasing advancements in technological knowledge taking place elsewhere.

The chapter's main argument was focused on three areas for the state to intervene successfully in promoting long-term impacts of ICTs. First is that the state should strive for the achievement of GPT potentials of ICTs. Second is that the state has to understand the economic conditions at the base of ADC economies in order to be certain where to direct what efforts etc. And third is that the state has to have knowledge on the diffusion pertinent characteristics of GPTs, or the patterns the diffusion process goes through.

The ultimate goal of technology uptake is to achieve economic and social transformation in ADCs, as a means to eliminating poverty and the digital divide in ADCs. Accordingly, I developed a theory for SI mediated social development – the SIMSD. I first advanced the theory framework model (Section 7.4.2), and then advanced an empirical tool for conducting 'techno-diffusion' scenario assessment, which I branded as the 'spider tool'. I described the tool as useful in unravelling the areas of strength and weakness in the mediation for technology diffusion. It can also be used as a monitoring tool in the process of interventive implementations of applied ICTs.

The chapter was capped with the evaluation of the theory development exercise. I used Whetten's theory building blocks as the reference points for the completeness of the developed theory in the chapter. I provided an itemised description of how each building block was utilised.

Having covered the theory development aspect, I now turn to drawing together the overall study's conclusions and making pertinent recommendations in the next chapter.

CHAPTER EIGHT: Conclusions and Recommendations

8.0 Introduction

Chapter Seven answered the study's fourth research sub-question, namely: "Should the state in ADCs intervene in the diffusion processes of ICTs to promote cultivated innovation for development?". In arguing that the state should intervene, the chapter also addressed the pertinent question of '*how?'* the state should intervene. In the chapter, a theory framework for the contemplated intervention was constructed, and a theory product towards the positioning of Social Innovation (SI) as a plausible form of mediation for social development, was also put forward. In so doing, the study's stated objective, which was 'to develop an empirically supported theoretical contribution on social innovation, for social development in the context of ADCs' (Section 1.5), was achieved.

This chapter presents the research summary, conclusions and a list of recommendations.

The rest of the chapter is structured as follows. Section 8.1 is a summarized overview of the study. Section 8.2 presents an outline of the contributions to knowledge made by the study. In Section 8.3 the recommendations are outlined. Section 8.4 highlights the respective possible further study areas. Section 8.5 presents the study conclusions.

8.1 Study Overview

The overview of the study is presented at two levels: the general and chapter specific content.

8.1.1 General Overview

The purpose of this study was to explore the perspectives of the community of stakeholders in the implementation of applied ICTs. It was argued that the prevailing attitude towards African Developing Countries (ADCs), sees these countries as only potential for 'use' of ICTs, and persistently pushes for 'acceptance' of externally conceived innovations. This perspective was contested; as was the current conceptualization of social innovation; and the prevailing methodological approaches for addressing the digital divide in ADCs. In place of these, it was argued that a different attitude towards ADCs is required and these countries should be acknowledged as potential innovation practitioners in the ICT4D channel. .

This study has called for a broad definition of 'digital divide' to incorporate 'digital innovation divide' in ADCs, and it has argued for greater consideration of the long-term impacts of focused

initiatives in applied ICTs. Specifically, it is suggested that GPT perspectives of ICTs should be promoted, as this would enhance the emergence and development of innovative complementaries and investment inputs, as the necessary catalysts for the ICT-GPT diffusion processes. This position was defended as being beyond artefactual centeredness, which addresses contemporary problems with a short-term focus, when a long-term focus is required.

One of the study's contributions was to suggest that there is a need for the agency of the state to play the role of structuring social arrangements, which I branded as 'social innovation machinery' (SIM). It was proposed that the combination of the agency of the state, and the structuring of social arrangements (i.e. social innovation machinery), provides an available option for ADCs to promote the diffusion of ICT-GPTs in the economies of ADCs,. This is because these two mechanisms function to influence factor productivity and economic growth in the long-term.

8.1.2 Chapter Specific Overview

Chapter One of this study presented the background of the study. The situation of concern the study sought to address was the limited scope in current conceptualizations of applied ICT implementations, for addressing the digital divide and enhancing social development. The chapter noted a need to change the perspectives of the Information society stakeholders, as these perspectives have persistently led practice in applied ICTs to focus on technology transfer; push for technology acceptance; and embrace short-term programmatic approaches. The chapter put forward perspectives that applied ICTs should seek to enhance internal capabilities of ADCs to manage the diffusion processes of Information and Communication Technologies in the sense of General Purpose Technologies (ICT-GPT). Motivation was provided for this approach by highlighting various perspectives of long-term impacts for the promotion of productivity and contribution to output. This was important to note because ICT interventions in their current form have not demonstrated potential to enhance economic growth. Technology advancements elsewhere are adding to ICT complexity, making ICT know-how continuously distanced from the people in the block of deprivation. The motivating research question and objective were as re-stated in Section 8.0.

Chapter Two presented a literature review of theoretical perspectives of ICT; as well as theoretical drivers in the application of ICT for developmental purposes, in developing countries, with a specific focus on Africa's developing countries (ADCs). The proposed conception of the diffusion of ICT that would be adopted in this study was presented, within the framework of perspectives of GPTs. A draft of the concept of Social Innovation Machinery (SIM), as an

exemplar of the fundamental social arrangements that are required in developing countries for purposes of situating ICT in local socio-economic contexts, was presented.

Chapter Three was dedicated to developing the theoretical underpinning of Social Innovation within the perspectives of the Capability Approach (CA). In this chapter, a conceptual framework for the study was outlined. The CA was explored in detail and its philosophical values were highlighted. The CA was used to consolidate the understanding of SI and SIM with the propositions of this study.

Chapter Four presented the description of the research paradigm, the interpretive scheme ,sources of empirical data, and the approach for data analysis and empirical findings. The research paradigm was described as being oriented to an ontology of social constructivism as it deals with the social world of technology and societies. The study's knowledge construction was said to be guided by interpretive epistemology, and its exploration was focused on the 'lived experiences' of technology deployment in the context of technological innovations and technology diffusion.

The chapter was utilized to demonstrate the application of a hermeneutic cycle approach for deciphering meaning from data materials, in relation to the Information Society as the corresponding social whole. The essence of the philosophical foundations mediating the generation of knowledge, and the observations for validity and reliability for the justification of interpretive knowledge, were pointed out. It was noted that the controls for the interpreter's subjectivity impacts to the interpretations, were implemented by maintaining '*interpretive awareness'* and *'intentional fulfilment'*.

As to the approach for empirical observations, the adopted research design was stated to be qualitative. The data used for observations were the ICT-based projects' descriptive textual materials, obtained from the electronic databases of WSIS stocktaking, and the IDRC. Content analysis techniques were used as the tools for data analysis, and the details of these were extensively elaborated within the scope of the study.

Chapter Five presented the analysis of the data and the findings. It was noted that a total of 369 text materials were captured from the WSIS Stocktaking and the IDRS databases, using literature and search terms identified to be relevant to the conceptual framework. Out of those, 246 texts were identified as relevant for the analysis at hand. (The reasons are given in the text.) It was observed that technological investments in ADCs are being primarily made for the purposes of providing access and connectivity; and these investments continually override or

ignore a need for investment in digital intellectual capacity in developing countries. Furthermore, it was found that the ICT community of practice emphasizes the addressing of social needs. Based on these findings, the thesis proposed that there needs be a shift of emphasis from addressing social needs to focusing on the cultivation of embedded diffusion processes of ICT for long-term impacts.

Chapter Six presented a consolidated discussion of the findings outlined in Chapter Five. It was observed in the chapter that donors and international ICT4D stakeholders play the key role in the implementations of ICT4D. They identify the concerns and develop content and values in their own worldviews, and then proceed to implementation interventions. It was also observed that these stakeholders' interests are in realizing short-term outcomes of their monetary and other resources value, and the way the Millennium Development Goals (MDGs) are stated fits this purpose. In other words, for the international Information Society, MDGs are used as the relating constructs of technology and development in DCs.

The Chapter also observed that the diffusion of ICTs in ADCs is lacking strategic inputs. Essentially these cannot be expected to come from outside, and this insight is used in the chapter as a backing for the argument for the situated agency of the state to fill the gap. A strategic input is necessary for the three elements of ICT-GPT diffusion - innovation complementaries, infrastructural inputs, and sectoral emergency; to take effect in the economies of ADCs'. These elements were seen to be key to the pervasiveness of ICTs, and to opening-up different developmental opportunities for the poor.

The chapter argued against the linking of technology to well-being, via targeting, to solve the prevailing 'social needs', as this practice is adversely impacting capacity-building for cultivated innovativeness. What is needed instead, is to enhance the capacity of people to mediate their own poverty alleviation, as this is a more appropriate long-term outcome of the diffusion processes of ICTs.

Chapter Six also was explicit on the technological knowledge and methodological gaps observed from the empirical research. These gaps were shown to be an obstacle to the ICT-GPT uptake in the economies of ADCs. The methodological gap was seen to be due to artefact-centricity in ICT4D. The technological knowledge gap was observed to lead to a technological trap in ADCs.

Chapter Seven presented a proposed agenda for the agency of the state in the diffusion processes of ICTs in ADCs. The argument was made for the state to intervene to fill the functional gap caused by the absence of strong and resourceful firms in the ADC economies. Strong firms, it

was argued, could drive the emergence of innovation complementaries, investments, and inter-sectoral linkages for the production and use of ICTs, but since they are lacking, state intervention is required. The agency of the state was also promoted as key in organizing social visions, setting policies, and developing strategies for the diffusion of ICT-GPT.

The chapter argued that the ways in which the state could intervene in order to press for the realization of long-term impacts of ICTs, include: striving for the achievement of GPT potentials of ICTs; understanding the economic conditions at the base of ADC economies in order to identify the potential action areas for intervention and the specific tools needed; and building knowledge on the diffusion patterns of GPTs.

Finally, the theory for Social Innovation mediated social development – the SIMSD, with its accompanying empirical tool for conducting 'techno-diffusion' scenario assessment in the name of 'spider tool', was developed in this chapter. The tool was described as being useful for analysing technology diffusion missions for their strengths and weaknesses.

In the rest of the current chapter (Eight), the contributions of the study to the body of knowledge are presented, recommendations are provided, and areas for further study are flagged.

8.2 Contributions of the Study

This study has exposed the global picture of the state of the diffusion processes of ICTs in ADCs. It showed that the process of diffusion of ICTs in the USA and Europe has shown that it is the firms (i.e. businesses) that have played the role of promoting the uptake of ICTs in their economies; the firms have been the source of *innovation complementaries* and *complementary investments*. In the process they have created a *dual base of producer and user firms* of ICTs, and *inter-corporate linkages*. On the contrary, it was observed that the corporate base in ADCs is narrow and weak in terms of investable resources; and furthermore, it is not in the interest of the donors and International Information Society stakeholders to promote the emergence of ICT-based firms in ADCs. Consequently, it is not surprising that the prospects for vibrant ICT-driven economies in ADCs are low. ICTs are narrowly appropriated, and are not in forms in which they can support factor productivity, economic growth, or social transformation for development.

From this global picture, the study has made significant contributions in two main areas: the areas of theory and of practice.

8.2.1 Contributions to theory

This study has used the perspectives of Capabilities Approach (CA), and the conception of the diffusion processes of ICT-GPT, to craft its contributions to theory. This is not something that has been done before to my best knowledge. The two main contributions made in the area of theory include the following:

(1) This study has developed a theory for the crafting for Social Innovation *as a societal capability*, and has been informed by the quest for societies' self-propagation through innovativeness *from within*. The necessary social arrangements for the diffusion-process-focussed propagation of ICT in ADCs, named as Social Innovation Machineries (SIMs), were also conceptualised as a contribution.

(2) A theoretical construct was developed as an output of the study. The put forward theory motivated a case for addressing the phenomenon of Social Innovation as a social construct. It emphasized the need for a shift from addressing isolated social needs, to promoting innovative capabilities with the states in ADCs themselves; with these ADCs taking a leading role in facilitating those capabilities for their own societies. The theory proposed in this study, also offered a model for cultivated ICT diffusion processes that have the potential to propagate ICT *for productivity* in DCs.

8.2.2 Contribution to Practice

The study makes three significant contributions to practice:

(1) For self-sustaining, long-term, ICT-supported social development, the study calls for the states in ADCs to take an active role in driving the diffusion processes of ICT, and to do away with contemplating technology uptake in the mode of technology transfer. The international community of applied ICT for development is already aware that development of ADCs should be contextually conceptualized. It is not viable to contemplate the development of ADCs as following in the same steps of developed countries. This is because the types of industry that played a gigantic role in propagating ICT and ICT productivity in the developed world are not as prevalent or as strong in ADCs. Consequently, for practical purposes, the states in ADCs have to compensate for this lack, by motivating for collective efforts, frameworks and policies, that are suitable for internally fuelling the emergence of innovations and innovators in local contexts.

(2) In providing knowledge of 'Social Innovation Machinery' (SIM), the study provides a motivation for the states in Africa to be mindful of the circumstances surrounding the

innovation phenomena. By using the modelled SIM provided by this study, the states can be able to understand action points which call for their intervention in the diffusion processes of ICT, rather that conceptualizing the diffusion of ICT as simply involving the up-take of already crafted innovations, regardless of where they originated.

(3) A techno-diffusion scenario assessment tool, *'the spider diagram'*, was developed as a contribution to practice; this tool should be useful in conducting assessments on the state of affairs by accommodating inputs from survey and expert opinion on specified technological diffusion aspects. This is a companion to the modelled SI-driven theory framework.

8.2.3 Evaluation of the Contribution

The validity of the contribution is very much dependent on the design of the study, the type of data collected, the mode of analysis, as well as the way in which the findings are presented. This study has strived to accommodate significant rigour by capturing project data exhaustively from the identified population in Chapter 4, and explicating the approach for data retrieval. Efficiency in the analysis of qualitative data was maintained by adhering to the literature review and conceptual framework construed themes.

Content analysis was applied as the principal technique for data analysis. To ensure validity, care was maintained in the specification of content for interpretation, by relying on complete passages (*the holos*) and not just key words, where the themes were used to signify the *holons* in the hermeneutic interpretation process. The use of complete passages was useful to emerge the themes as content.

The purpose of the study - to develop a theory product, helped to maintain the philosophical base for the literature review, the development of themes for empirical observations, and the modelling of the theory framework. In turn, the process maintained coherence in the study as a whole.

8.3 Recommendations

I have five recommendations to put forward from this study:

Recommendation One: The study has explicated the dominance of the exotic (in the sense of 'derived from foreign shores') drive of the ICT community of practice in its efforts to influence development in developing countries using ICT. Such an approach has a tendency to address social development superficially. This study recommends to governments in developing countries, that they should take deliberate actions to cultivate locally-driven, inward-looking,

social innovation processes that drive social development. Governments should also strive for national innovation systems that recognize that individuals can also be potential drivers of value creation from knowledge.

Recommendation Two: The study has exemplified a strong, persistent, technocentricity in the arena of applied ICT practice, which is contrary to the stated emphasis on the social implications of technology that is called for in literature. Furthermore, the social factor in applied ICT has been equated to a focusing of technological innovations on social needs. It is a recommendation of this study to change the emphasis in practice, and aim for a balance between technology and social empowerment for innovation. Indeed, it is not enough to concentrate on contextual considerations in applied ICT initiatives without promoting local capacity for technological innovations. For instance, digital education at the early stages of children's growth could be a positive move towards cultivating digital master minds (i.e. innovators) of the future. Countries in Africa could implement policies to drive the technology-centered-development agenda and understand the weaknesses inherent in exotic initiatives, especially in the current globalized world economic order.

Recommendation Three: Developing countries need to develop human capital for ICTs by equipping their people with skills and knowledge at an appropriately early age. Enthusiastic youth have a potential to lead technological innovations. People in Africa need to think for themselves to be able to assimilate ICTs in their economies in situ. It is the appropriation of ICTs in different areas of walks of life by the people that can transform ADCs, and not just targeting MDGs. The MDGs are driven by donors, after them then what?

Recommendation Four: While there is a talk of this among information systems researchers and practitioners in applied ICT, the idea of *operationalizing ICT for productivity* is not being heard in the talk of leadership in Africa. Apart from in North Africa, and a few countries such as Rwanda in East Africa (http://one.laptop.org/map/rwanda), there are no conspicuous voices among other African countries to strategically approach the theme of ICT for future productivity. There needs to be more motivating of leaders in this regard.

Recommendation Five: The field of Social Innovation is calling for a broader definition of social needs whenever technological interventions are contemplated. More academic and government support for such a broad view should help to provide broad-front action plans that incorporate multi-dimensional interventions. For example, if the need is defined beyond providing access, the academic front may come in to develop databases for the local context. Other departments such as the ministry dealing with health affairs, the ministry dealing with

agriculture, or fisheries, or forestry, may then devise strategies to take forward the opportunities created by the ICT initiatives.

8.4 Further Research

To design for effective social arrangements that will work to immerse ICT in the production processes of developing countries, is an exercise in need of a range of knowledge on policy formulation, development economics, and African contextual environments. For specific operationalization of the proposed SIM, SI and ICT-GPT, customized studies in the regions and areas of choice are a necessary prerequisite. This would need to cater for the environmental counterpart of social arrangements in the freedom of functionings, according to CA. Already there is a noted lack of Africa's voices in the policy arena for ICT4D. This silence is obviously not out of contentedness. A lot of speculations can be levelled against this. For instance, it could be for the lack of capacity to generate ideas in the line of ICT4D for home effects. Or, it could be because of the lack of the impetus among decision makers in DCs to put different forms of ICTs in their developmental priorities. Such speculations can only be resolved through further conceptualizing research.

8.5 Conclusions

This study is set against the background of a deep concern that the efforts being exerted by applied ICTs for development in African Developing Countries, are not leading to long-term economic growth and socio-economic transformation in these countries. This situation of concern informed the development of an agenda for the study by revealing *assumptions* inherent in both definitions of 'digital divide' and in perceptions that are driving technological interventions for addressing the digital divide and underdevelopment in ADCs. These assumptions were then advanced into a problem statement that there is a need for adequate theoretical foundations to appropriately guide ICT deployment and application initiatives for effective social development in Africa's DCs.

The study made the claim that the economic problems of developing countries require a broad front, *strategic* approach. It was argued that instead of perpetuating a utilitarian focus on tackling social needs, the pragmatic world of applied ICTs in developing countries, should instead deploy approaches that focus on ICT interventions that have *long-term* rather than short-term impact, and more specifically, that realize a growth in factor productivity and output contribution of ICTs. The obsession with short-term problem-solving-focused activity, and externally motivated and driven interventions, are prolonging technological dependencies of

ADCs on donor communities and creating a technological knowledge trap for the deprived communities.

This study set out to make a theoretical contribution that promotes the uptake of applied ICTs within the economic bases of ADCs, in order to effect long term socio-economic impacts in ADCs that can be locally sustained. One of the resulting conclusions of this exercise, was that the ADCs should themselves assume agency in the process of ICT diffusion. Implicit in this, it may be argued, was my own assumption that ADCs are able and capable of doing so.

It is possible that a reader who is not 'indigenous' to Africa as I am, may find it difficult to believe that ADCs are capable of taking an active role in driving the diffusion processes of ICT within their own countries. This makes the philosophical contribution of this study, with its argument in favour of such an approach, all the more important. The states in ADCs need a theoretically and empirically informed impetus to drive forward good reasons why collective efforts, frameworks and policies, that are suitable for internally fuelling the emergence of innovations and innovators in local contexts, are so very necessary. It is my sincere hope that this PhD contribution will serve to contribute to supporting those who believe, like me, that it is indeed possible for ADCs themselves to both assume an agency role in driving ICT diffusion in Africa, and to effect the kinds of long-term economic growth and socio-economic transformation that is most appropriate to their own local contexts.

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APPENDIXES

Appendix AA: Market Capitalization of Stock Markets Country-wise Globally

Country	2010	2011	2012		Country	2010	2011	2012
Africa					France	1,926.5	1,568.7	1,823.3
Botswana	4.1	4.1	4.6		Germany	1,429.7	1,184.5	1,486.3
Cote d'Ivoire	7.1	6.3	7.8		United Kingdom	3,107.0	2,903.2	3,019.5
Egypt, Rep.	82.5	48.7	58.0		Netherlands	661.2	594.7	651.0
Ghana	3.5	3.1	3.5		Norway	250.9	219.2	252.9
Kenya	14.5	10.2	14.8		Poland	190.2	138.2	177.7
Malawi	1.4	1.4	0.8		Sweden	581.2	470.1	560.5
Morocco	69.2	60.1	52.6		**America**			
Namibia	1.2	1.2	1.3		Brazil	1,545.6	1,229.0	1,229.8
Nigeria	50.9	39.3	56.4		Canada	2,160.2	1,906.6	2,016.1
South Africa	635.3	523.0	612.3		Chile	341.6	270.3	313.3
Tanzania	1.3	1.5	1.8		Costa Rica	1.4	1.4	2.0
Uganda	1.8	7.7	7.3		USA	17,139.0	15,640.7	18,668.3
Zambia	2.8	4.0	3.0					
Zimbabwe	11.5	10.9	11.8		**Asia**			
Europe					Bangladesh	15.7	23.5	17.5
Belgium	269.3	229.9	300.1		China	4,762.8	3,389.1	3,697.4
Denmark	231.7	179.5	224.9		Hong Kong	1,079.6	889.6	1,108.1
Finland	118.2	143.1	158.7		India	1,615.9	1,015.4	1,263.3
					Russia	1,004.5	796.4	874.7

Source: http://data.worldbank.org/indicator/CM.MKT.LCAP.CD

The listings on country bourses (Table F-2) is used to proxy for the breadth of economic players in a select of African economies as per the indicated source. The listings data are the 2014 approximates. Again South Africa, Egypt and Nigeria are exceptions. The rest testify against the narrow base of industry in Africa's DCs. Together with market capitalization, the overall context is of a weak resource base for the duo-industry propagation of ICT.

Appendix AB: Listings on Stock Exchanges in Africa (2014)

Economy	Location	Listings	Link
Côte d'Ivoire	Abidjan	39	BRVM
Algeria	Algiers	5	SGBV
Botswana	Gaborone	44	BSE
Cameroon	Douala	2	DSX
Egypt	Cairo	833	EGX
Ghana	Accra	34	GSE
Kenya	Nairobi	64	NSE
Libya	Tripoli	7	LSM
Malawi	Blantyre	14	MSE
Mauritius	Port Louis	88	SEM
Morocco	Casablanca	81	Casa SE
Namibia	Windhoek	32	NSX
Nigeria	Lagos	223	ASCE
Rwanda	Kigali	5	NSE
Seychelles	Victoria	4	RSE
South Africa	Johannesburg	402	JSE
Sudan	Khartoum	54	KSE
Swaziland	Mbabane	10	SSX
Tanzania	Dar es Salaam	17	DSE
Tunisia	Tunis	56	BVMT
Uganda	Kampala	17	USE
Zambia	Lusaka	16	LuSE
Zimbabwe	Harare	81	ZSE

Source: www.world-stock-exchanges.net/africa.html

Appendix A: Search results from WSIS Stocktaking Database and IDRC.

Search Term in the DB	Results		Project Description	Place & Year
WSIS DB	All	Resident in Africa		
ict4d projects in Africa	186	25	Implementation of a National E-Strategy (ICT4D) Plan **Development Information Network** With the official launch of the Information and Communications Technology for Development, ICT4D plan document, all the federal government ministries, departments and agencies have been urged to start full implementation of the ICT agenda relevant to them. The ICT4D plan is seen as a major tool for driving the Vision 2020 target set by the federal government [...]	Nigeria 2011
Social innovation in Africa	6	0		
Social aspects of ICTs	0	0		
Human Development	170	24	Developing ICT human resource development strategy The ICT human resource development requirement of the country is studied. Based on the results of the study, there is a critical need for developing a human resource capital for ICT development in the country. Therefore, a strategy for planning and guiding the human resource development endeavour is being drawn up for building the capacity to rapidly develop ICT in the country. [...] Elaboration of Child Safety Online Action Plan for Mauritius	Ethiopia 2004

			As prescribed by the National ICT Strategic Plan, a Child Online Safety Action Plan has been elaborated and has been endorsed by Government in January 2009. The plan contains 24 projects to be implemented by stakeholders including the Police, Ministry of Women's Right, Child Development and Family Welfare, Ministry of Education, Culture and Human Resources, Ministry of ICT and the Internet Management Committee under ICTA. The implementation of the plan is currently underway and include • Sensitization measures targeting children, parents and the public at large by all stakeholders • Safety measures for schools, cyber cafes and public internet access points • Best practices and regulations to be implemented by Internet Service Providers and Cyber cafes. • Elaboration of the Child Safety Online Bill (currently at Attorney General's Office) • Enhancing international collaboration and enforcement measures [...]	Mauritius 2010
			Mobile Internet Unit It is the aim of the government of Egypt to provide access to each and every corner in the nation. This has proven a challenge with the unbalanced infrastructure setup and the accessibility to technical requirements for such a provision. However, MCIT refused to give in to these obstacles and in an agreement with the United Nations Development Programme (UNDP) and the Italian Cooperation set it as its goal to expose rural and remote communities to ICT. MCIT finds that such exposure is the key to acting as a catalyst in human development resulting in shrinking the unemployment rates and increasing productivity. The Mobile Internet Unit, as the term suggests, is a vehicle that is equipped with computers that travel to remote areas to provide access to technology and entrance to cyberspace. The unit is not merely equipment but it is a comprehensive program for members of the community to become equals with any metropolitan resident. Courses are offered for computer literacy, internet access, business skills, and more [...]	Egypt 2010
			E-Learning Competence Center (ELCC) ELCC was founded in 2004 as an alliance between the Ministry of Communications and Information Technology (MCIT) and Cisco Systems, the E-Learning Competence	Egypt 2007

			Center (ELCC) is Egypt's leading organization in e-Learning with a track record of developing and delivering a wide array of state-of-the art e-Learning courses and content, setting and disseminating the quality standards of e-Learning, providing best practice research and expert consultancy in e-Learning and engendering the first wave of facilitators and e-trainers into the market. To this end, the purpose of the ELCC is to act as a hub for the integration, development and dissemination of e-Learning content of relevance to the Egyptian market. [...] Cyber Peace Initiative The Cyber Peace Initiative (CPI) was launched by The Suzanne Mubarak Women's International Peace Movement on September 1st 2007 in Sharm El-Sheikh at the International Youth Forum. It has made significant progress towards its overall objectives, namely to empower the youth of all nations to become catalysts for change through ICT. Cyber-Peace aims to promote the "Peace Culture" which is defined by the United Nations as "a set of values, attitudes, modes of behavior and ways of life that reject violence and prevent conflicts by tackling their root causes to solve problems through dialogue and negotiation among individuals, groups and nations" (UN Resolutions : Culture of Peace and , Declaration and Programme of Action on a Culture of Peace). This aim could be achieved by improving communications across cultural and geographical barriers through content development, platform creativity, by exploring the socio political impact of IT enabled industries, exploring in depth ICT as a channel for economic opportunities and innovation for youth, and by engaging youth in securing the Internet as the medium through which these objectives will be achieved. The Initiative rests on capitalizing on the creative spirit of youth to innovate constantly-changing Internet based content and IT platforms that should match the pace of socio-political changes and developments in real life. CPI mission is to empower youth of any nation, through ICT, to become catalysts of change, [...] The Promotion of ICTs in Sohag Governorate	Egypt 2010

			Under the umbrella of "ICT to Foster Egypt's Sustainable Human Development", the ICT Trust Fund conducted a competition/award program between NGOs, to encourage civilian organizations to share in the development of their communities. The ICT Trust Fund in cooperation with MAIS (an Italian NGO working in Egypt), Caritas and Lotus, undertook the project in the Sohag Governorate, where there is computer scarcity and difficulty accessing IT services. Through the project MAIS was able to establish 4 computer labs in 4 different cities, and 2 labs in 2 special needs schools for the Blind and the Deaf. The project has enormous resonance for the CDA members and the youth in the 4 villages in the suburbs of Sohag, and has helped many trainees in achieving success, which will encourage the repetition of similar initiatives in other villages. The project has achieved its desired objectives, with a total of 452 trainees and special needs students being trained. [...]	Egypt 2008
			WBDC / Microsoft Training The Women's Business Development Center (WBDC) of the National Council for Women signed a protocol of cooperation with Microsoft Egypt in March 2007 for training 150 fresh graduates in 2007. The project aims at building human resource capacity. The courses focused on a basic IT course which …The project aims at providing training for women entrepreneurs and their women employees, on the two basic IT courses, as well as training on the operation of small and micro enterprises with scientific tools to increase efficiency and productivity. [...]	Egypt 2008
			National ICT Research and Development Centers of Excellence The Centers of Excellence are virtual or physical centers of sustained distinction in research in key areas of national and global areas of knowledge that simultaneously generate highly qualified human resource capacity. They concentrate and build on existing capacity and resources to enable [...]	Egypt 2007

			The e-Learning Competence Centre "eLCC" MCIT in cooperation with Cisco has set up the e-Learning Competence Centre (eLCC) to create an organization to lead and coordinate all e-Learning projects in Egypt. e-LCC will primarily upgrade the local corporate culture and support the private sector driven economy. It will actively take steps to enhance workforce performance through high quality, practical, state of the art e-Learning and human resources development activities in accordance with the government and business communities evolving needs. [...]	Egypt 2007
			The Local Government Development Project The main objectives of the local Government development Project is to provide convenient, accurate, fast and efficient government services to governorates residents and achieve an integration of different government services; to simplify procedures, establish backend systems, and unify services work cycles in order to reach transparency and regulatory climate. In addition to training of employees on using IT and developed work methods in an enhanced work environment. The Project includes activities such as Services Automation Human Resources Development Procedures Re-engineering ICT Infrastructure Civil Works> The pilot project is implemented in Alexandria governorate [...]	Egypt 2007
			Community Development Portal The Community Development Portal (CDP) aka Kenana Online offers several online services; such as syndicated news, currency prices, a website directory, job search, and a multilingual dictionary. In addition there are development-oriented articles, categorized by subject under the Kenana Library section. It is an exclusive archive of content pertinent to human development written by experts in a simplified manner and	Egypt 2007

			based on authoritative sources, such as self-improvement skills, vocational guidance, healthcare empowerment, SMEs and NGOs. CDP began to seek a further involvement of its users in terms of creating content, either that handling their own localities (remote ones in particular), developmental experiences (in case of civil associations), personal experiences (of self-made learning and work in private SMEs) or online interests. In doing so, CDP gave away a personal web space for every registered user to manage it on his/her own via user-friendly content management tools. [...] Mobile IT Club The aim of this project is to expose rural and remote communities to Information and Communication Technologies (ICTs) for the purpose of enhancing particularly human development. This project will implement a Mobile IT Unit that will service rural communities in Egypt. The MIU concept is simple: A vehicle equipped with computers and has an Internet access that travels to rural areas offering short and focused courses in computer literacy. In this context, the MIU has the potential to effectively improve the extension of computer-based training using the following strategy: MIUs have also been extremely flexible in assuming other roles, in public relations exercises, and as computer rooms for conferences. Another important application is the use of MIUs for public sector employees' training for instance, an MIU can be easily driven and parked in front of a public administration institution and administer educational courses on specific subjects efficiently, without the need to set up a room specifically for that. At the end of each workshop, the project is expected to have exposed trainee to the capabilities of computer and Internet technology. [...] Universal Networking Language (UNL) The mission of the UNL program, initiated within the United Nations and devised by the Universal Networking Digital Language (UNDL) Foundation, is to enable all people to generate information and have access to cultural knowledge in their native languages. UNL is an artificial language attempting [...] To use ICT to create jobs for the thousands of unemployed educated youth in Kenya,	Egypt 2007 Egypt 2007

			especially young women.	
			By starting an International Call Centre in Nairobi, Kenya, our organization is looking at creating an opportunity for the numerous unemployed University graduates, Polytechnic graduates as well as the thousands of "O" level students who have no jobs. 80% of all the employees will be women given [...]	Kenya 2006
			New Regional Centre in Tunisia to Help Youth Participate in the Knowledge Economy UNESCO and Microsoft Corp, in cooperation with the Youth Observatory of the Tunisian Ministry of Youth, will inaugurate the InfoYouth Centre, a regional community technology centre for North Africa, designed to provide youth with access to, and skills training in, the information technologies (IT). [...]	Tunisia 2006
			UNDP ICTDAR extends its initiative "WRACTI- Empowering Women Through Knowledge" to Palestine and Morocco ICTDAR, as part of UNDP and through its initiative WRACTI of educating women on their rights and the rights of their children within their communities aims at achieving two of the UNDP Millennium Development Goals, namely eradicating poverty and achieving gender equality and empowering women. "ICTs [...]	Palestine and Morroco 2006
			MILLION BOOK PROJECT AND BA'S DIGITAL ASSETS REPOSITORY (DAR) Introduction The Million Book Project aims to create a universal digital library that will foster creativity and widespread access to knowledge. Bibliotheca Alexandrina (BA) and its partners are working together to demonstrate the project's feasibility by digitizing one million books within [...]	Egypt 2006
			IBRAHIM SHIHATA ARABIC UNIVERSAL NETWORKING LANGUAGE CENTER (ISAUC) Introduction The mission of the Universal Networking Language Program (UNLP),	

			initiated within the United Nations and devised by the Universal Networking Digital Language (UNDL) Foundation, is to enable all people to generate information and have access to cultural knowledge in their native [...]	Egypt 2006
			GAMAL ABDEL NASSER COLLECTION The late President Gamal Abdel Nasser played a vital role in shaping the political, economic and social life of Egypt and the Middle East from the early 1950s and until the early 1970s. Publishing his collection on a searchable website (www.nasser.org) is a major contribution to BA's mission of [...]	Egypt 2006
			DIGITIZATION OF DESCRIPTION DE L'ÉGYPTE The Digital Library of The Modern History of Egypt is a cornerstone of Bibliotheca Alexandrina's (BA) integrated digital library, designed to include collections from all over the world related to the modern history of Egypt. The digitization of Description de l'Egypte is one of the products of BA [...]	Egypt 2006
			ARAB INFO MALL DATABASE AND WEBSITE Inspired by the Ancient Library, the Bibliotheca Alexandrina (BA) aspires to be an effective catalyst for reform and development in the region and to serve as a meeting point for Arab civil society organizations. Therefore, it is crucial to provide Egyptian and Arab civil society an opportunity for [...]	Egypt 2006
			AL-HILAL DIGITAL COLLECTION Introduction The Digital Library of The Modern History of Egypt is a cornerstone of Bibliotheca Alexandrina's (BA) integrated digital library. It is designed to include collections of specialized libraries belonging to eminent Egyptian politicians, authors and historians as well as content from [...]	Egypt 2006
			FEASIBILITY STUDY FOR THE DEVELOPMENT OF VIRTUAL LIBRARY FOR	

			AND BY HIGHER EDUCATION INSTITUTIONS IN NIGERIA The challenge for Nigeria is to expand access to education & current learning materials without most of the required funds disappearing in to physical expansion of libraries & related structures. 2. President Obasanjo asked the Director General of UNESCO to facilitate the development of an actionable, technically feasible, cost-effective, future-proofed & sustainable plan that sets out a road map to efficiently deliver local & international content to all Nigerian HEI's [...] ENSTINET The Egyptian National Scientific and Technical Information Network (ENSTINET) is a public information services organization. The overall objective of ENSTINET is to assist Egyptian problem solvers and decision makers to access and apply quality data and relevant, current information to development activities. The STI project aimed at ensuring availability and utilization of accumulated knowledge required to foster the socio-economic development of Egypt. ENSTINET provides the Egyptian research Community with a full 24/7 online as well as onsite access to global information resources via the INTERNET. On the local level, ENSTINET has been developing and maintaining local databases for several years. These databases contain both the literature published in Egypt in the field of science and Technology, and directories needed to assist the researchers [...] Building an Investor Environment for ICT Development in Africa "Promoting ICTs Infrastructure Development" was the theme of the Second ITU Public Private Sectors Partnership Forum (PPPF-Africa) held in Kampala, Uganda from 30 October to 2 November 2004. The Forum brought together high-level representatives of ministries in charge of ICT strategies and [...]	Nigeria 2006 Egypt 2004 Uganda 2004
Capacity Building	294	56	Capacity Building for ICT Policymaking The project aimed to build sustainable national capacity in developing countries to build up and implement ICT policies and e-Strategies harnessing the potential of ICT	International 2008

			for development. It's implemented jointly by UNESCAP and UNECE to stress the link between the use of ICT and promotion of development, including the achievement of the MDG, in particular Goal 8 "Develop a global partnership for development". The project initiated in 2006 with a regional seminar on Capacity Building for ICT Policymaking in Central Asia in Kyrgyzstan and finalized in 2007. As follow-up activity, Azerbaijan and Tajikistan organized national capacity-building seminars on ICT Policymaking. [...] Global Capacity Building Initiative(GCBI) The World Bank and infoDev, working in a partnership with the ITU, are building on the success of the infoDev-ITU ICT in Regulation Toolkit to develop a Global Capacity Building Initiative (GCBI) for regulators in developing countries. The partners are launching this program in Africa, beginning with the Comesa region. The program seeks to partner with universities, regional regulatory associations and other training institutes in Africa to offer training and capacity building opportunities to regulatory staff across Africa. [...] Strengthening the telecentres in Kenya for effective knowledge management and networking through capacity building **Kenya Network of Telecentres** Kenya Network of Telecentres (KenTel) works with a number of partners to support the growth and sustainability of telecentres. Telecentres offer the critically needed shared access in rural areas of Africa. Its therefore necessary that they are given the support they need to enable them offer quality and effective services that are sustainable and community owned. [...] Capacity Building in IPv6	Africa Comesa 2007 Kenya 2012 Sudan 2012

			National Telecom. Corp. 8 participants from various government institutions in Sudan attended Professional Training & Certification at NAv6 on Mar 2011. Arranged by National Telecom Corporation (NTC) of Sudan This facilitate NTC to establish an "Authorized Training Centre in IPv6" in Sudan and train, nurture and develop local expertise in IPv6 [...] Capacity Building for Contact Centers **Information Technology Industry Development Agency "ITIDA"** Providing technical and financial support to Contact Centers ; to achieve Certification. This is performed through Management Awareness, Registered Coordinator Training, Consultations, and Certification. The ICT Strategies for Accessibility, Capacity-building, and Poverty Reduction among the blind Community in Ethiopia **Adaptive Technology Center for the Blind (ATCB)** The ATCB innovative intervention of ICT for the blind in Ethiopia, has registered the following changes in the lives of blind students and professional who were dependent on the help of sighted for reading and writing to perform their duties. •An access to printed materials using a scanner and optical-character-recognition (OCR) software; • Access to computer networks, including the Internet; •Dropping acute shortage of Braille reading materials to the beneficiaries; •Better readability and greater tactile appeal, as well as major improvements in the formatting and general content of the embossed text; •Empowerment and self-reliance of trained visually impaired Braillists employed at the Center; The computer training program and Braille production have enabled blind users to gain valuable knowledge and skills in fundamental computer applications. Thus, they can now comfortably work on their office and home PC's, something one would not even have imagined a few years ago. So not only have their competence and productivity increased, but they are also in line for equal social	Egypt 2007 Ethiopia 2006

			participation, to contribute their share in the service of the entire community. This project has been submitted to the Golden Book database. [...] Building R&D capacity in African Universities UNECA (Economic Commission for Africa) The R&D activities of the ECA led VarsityNet programme builds on the WSIS Action Plan, which calls for cooperation in R&D programmes and exchange of know-how. Projects supported by the Ford Foundation are taking place in the Inter-University Council for East Africa (IUCEA) and the Addis Ababa University (AAU). The IUCEA is piloting the development of a web and database application whilst AAU is designing a web based, multilingual and multi-alphabet document exchange platform for use by the government. [...] TDev21 - **Kenya - GESCI** Teacher Development for the 21st Century Goals •Pilot an ICT Competency Framework for Teachers in Tanzania. Three phases: •Needs assessment •Contextualization of ICT-CFT •Capacity building of key ICT$E stakeholders Result •Contextualized ICT - CFT •Capacity Building oICT-CFT Familiarization oContent guidelines oAssessment/certification options Challenges Need to upgrade secondary teacher capacity to combat poor student performance in core subjects Next Steps Pilot ICT-CFT in pre-service and in-service channels Numbers and Links Pilot in four Teacher Colleges and two Faculties of Education [...]	International 2005 Tanzania 2005

			Universal ICT Education Programme (UIEP) Phase II **National Computer Board (under Ministry of Information and Communication Technology)** This initiative is in line with the WSIS action line of e-learning for capacity building whereby more than 2700 Online professional IT and non–IT courses are offered at very affordable prices to all those who have a recognised certificate in IT. The main objectives of the programme are to:- i. Democratise access to quality content online ii. Create an adequate pool IT Professionals to drive the growth of the IT Industry iii. Promote e-learning As at date, 600 participants have registered for the different course packages and are following their respective courses online. [...]	Mauritius 2012
			ITAN WSIS Report 2012 **Information Technology (Industry) Association of Nigeria** Information Technology (Industry) Association of Nigeria (ITAN) within the period under review conducted and participated in workshops, seminars, fora and capacity building programmes in Nigeria and overseas as part of its contribution to the WSIS Action Lines (AL) and targets realization. [...]	Nigeria 2012
			Interconnected-Parliaments: Africa i-Parliaments Action Plan **UNDESA (United Nations Department of Economic and Social Affairs)** The Africa i-Parliaments Action Plan is an Africa-wide initiative that aims to modernize African Parliaments' information management capabilities and provide them with skills, services and applications that will allow them to become open, participatory, knowledge-based and learning organizations. [...]	International 2010

			Commonwealth African Rural Connectivity Initiative **Commonwealth Telecommunications Organisation** Launched in 2007, the first phase of COMARCI resulted in a research of the status of rural connectivity in 18 African countries along with the policies and regulation in place in comparison to five comparator countries (Australia, Canada, India, Malaysia and the US) together with identification of [...] West Africa Mission **International Multilateral Partnership Against Cyber Threats (IMPACT)** The objective of this programme is to conduct readiness assessment for Ghana, Nigeria, Ivory Coast and Bukina Faso to implement CIRT-Lite and provide capacity building workshops. The mode of assessment is different breakout sessions for each country. East Africa Mission **International Multilateral Partnership Against Cyber Threats (IMPACT)** The objective of this programme is to conduct readiness assessment for Tanzania, Uganda, Kenya and Zambia to implement CIRT-Lite and provide capacity building workshop. The mode of assessment is different breakout sessions for each country.	Pan-Africa 2010 West Africa 2010 Tanzania, Kenya, Uganda, Zambia 2010

			e-education and telemedicine **Gedaref digital city organization GDCO SUDAN** 1- GDCO established 2 computers laboratories (100 PCs) with the help of DSE in the faculty of computers science and 20 PCs for the community college in Gedaref University. 2- GDCO donated two units fully equipped with computers 20 square meters each as an e-library to Gedaref University. 3- GDCO [...]	Sudan 2010
			e-agriculture project **Gedaref digital city organization GDCO SUDAN** Objectives of e-agriculture The e-agriculture project is a public private partnership for community development. The objectives of the project are 1) agriculture development through ICT specially GIS & GPS and monitoring of agricultural resources from being depleted or eradicated 2) development of national and global crop marketing online to help the farmers sell their products 3) increasing crop yield and decreasing cost of crop production 4) exchange of Knowledge and best practices between farmers to establish strong partnership to improve agricultural practices 5) enhance capacity building and improve the quality of training of the agricultural sector. 6) Achieving the 8th millennium developments goals (8MDGs). 7) Investment in the ICT sector and make the Telecentres more sustainable. Project implementation (steps) 1- GDCO and DSE donated 15 computers to gedaref mechanized agriculture corporation GMAC, 21 PCs to the farmers unions - more than 100 agricultural engineers and staff of GMAC were trained the basic of the computers courses then 30 of them were trained many courses on GIS and GPS in GMAC Telecentre. 3- A database for GMAC farmers was developed and the information of more than 10.000 farmers was included in the system of GMAC. 4- Determining the geographical coordinates of the farms by old staff and newly trained engineers which lead to the natural resource electronic (digital) map of Gedaref state. 5- Designing a web portal for the crops prices	Sudan 2010

			www.gedaref.com/markets 6- Under designed agro-mobile service in partnership with Drishtee organization (India) is in process. http://202.71.128.176/mobile/sudanmobapp The project achievements (values) 1- GDCO build a huge database for Gedaref mechanized agriculture corporation (GMAC) where more 10.000 farmers database was in the system of GMAC which ease and make quick transaction between the farmers and GMAC to get their document (renewing,, agriculture reports,,) where farmers used to renew their farms certificates annually (it is electronic before but it stopped in 2006 due to virus and programming for more than 9999 farmers) and when we started the project in 2007 the service is done manually in two to three days, but now they can renew in few minutes. 2- The electronic (digital) map which is the legitimate child for this partnership. This e-map contains all the information about the agricultural area, pastures, forest and rivers in Gedaref state with clear points and demarcation of the animal routes, farms edges forest boarders which help in solving many conflicts between the farmers and shepherds and keep the forest from being eradicated. 3- A lot of information about the quality and quantity of crops are available through the web portal of crop markets which provides farmers, traders or any one who need the service with prices of many crops, vegetables and animals in the web portal [...] ESCWA Technology Center for Development UN-ESCWA The ESCWA Technology Center for Development aims at supporting national and regional capacity-building in science, technology and innovation (STI) and building linkages between supply and demand for STI in Western Asia. This project constitutes a typical manifestation of regional cooperation and [...] International Computer Driving License (ICDL) Ministry of state for administrative development (MSAD)	Western Asia 2010

			Building staff capacity is the key enabler of modernizing the administrative body. What does it worth to set technologies and modern systems in places without getting the skillful hands to operate it. To this end, Ministry of State for Administrative Development undertakes a leading initiative in promoting e-literacy among government employees. The project aims at elevating level of ICT literacy among employees in the Egyptian administrative body. The national project is taking place throughout Egypt on both central and local level. The project also pursues and addresses remote and rural areas through different channels. In 2008, the project covered 11503 trainees, whereas in 2009, it covered 14538 trainees in more than 23 governorates and 31 ministries and governmental bodies. [...]	Egypt 2010
			Information and Communication Technology Assisted Development (ICTAD) DED Deutscher Entwicklungsdienst on behalf of Federal Ministry for Economic Cooperation and Development (BMZ) on behalf of Federal Ministry for Economic Cooperation and Development (BMZ) The government of Ethiopia intends to utilize ICTs as enablers for implementation of the country's development program and has embarked on a major National ICT Capacity Building Program. The vision for this program is to ”develop and exploit ICTs as an accelerator for the attainment of national [...]	Ethiopia 2010
			Connect a School, Connect a Community International Telecommunication Union Connect a School, Connect a Community is a new public-private partnership effort to promote broadband school connectivity to serve both students and the communities in which they live. Connected schools have the potential to serve as community ICT centres to provide access to services for persons living in rural, marginal urban and isolated areas, with a particular focus on disadvantaged and vulnerable groups such as women and girls, indigenous people, persons with disabilities and youth and children. Through Connect a School, Connect a Community, ITU will work with a range of	International 2010

			partners to identify and compile best practices on polices, regulation, applications, services and practical experiences to be shared with interested countries through the development of an online Toolkit and related capacity-building activities. ITU is also actively seeking partners interested in funding projects on the ground to put into practice the best practices. [...] ITU Academy **International Telecommunication Union** It is imperative to avoid that the "digital divide" also becomes a "knowledge divide" between those who have access to the information and learning tools of the 21st century and those who do not. Recognizing this, global leaders at the World Summit on the Information Society (WSIS), held in 2003 [...]	International 2010
			e-Government and rural connectivity **Centre for e-Innovation** The centre for e-innovation is a government entity that deploys infrastructure for e-government as well as rural connectivity in the Western Cape Province of South Africa. The unit is responsible for rolling out and refining the Pronvince's e-Goverment strategy. The main project which facilitates ICTS in rural areas is called Cape Access - and this provides free connectivity, capacity building, e-learning and access to government services. [...]	South Africa 2009

			it@ab - the Southern African Network on "Information Technology in African Business" **InWent Internationale Weiterbildung und Entwicklung gGmbH on behalf of Federal Ministry for Economic Cooperation and Development (BMZ)** InWEnt in cooperation with reputed IT consulting firms, IT training institutions, business promotion agencies and universities as well as internet service providers established it@ab in 2000 in the SADC region (Angola, Malawi, Mosambique, Namibia, Tanzania, South Africa, Zambia). it@ab provides state of the art know-how in the field of ICT and opens e-business opportunities to enterprises, institutions as well as governmental and educational/commercial organisations. it@ab promotes local business development as well as regional business cooperation and connects the movers and shakers of ICT in SADC. it@ab stands for cross border cooperation of ICT multiplying institutions. On an international level it@ab offers business contacts and cooperation opportunities with companies and institutions in South East Asia and Europe. Additional focus of it@ab lies on capacity building for IT specialists. it@ab provides specific training programs to secure a broad know-how basis for ICT on local, regional and international levels. [...]	SADC – (Angola, Malawi, Mozambique, Namibia, Tanzania, South Africa, Zambia) 2009
			Training of multipliers for Blended Learning / e-Learning InWent Internationale Weiterbildung und Entwicklung gGmbH on behalf of Federal Ministry for Economic Cooperation and Development (BMZ) The comprehensive German programme "Engineering Capacity Building Programs (ECBP)" supports the decentralisation of vocational training in Ethiopia, so that specific forms of qualification can meet the local and regional demand more propperly.	Ethiopia 2009

			A necessary precondition to reach this goal are capable [...]	
			Internet-Based Environment Information System **ITU (International Telecommunication Union)** This project focuses on the development of a sustainable Internet-based Environment Information System to allow African countries to more effectively collect, manage, share and make use of environmental data. A training component in the use of ICT systems for data collection and management is [...]	Africa 2008
			Strengthening African Capacity for Cost-Effective Access to the Internet **ITU (International Telecommunication Union)** The project will contribute towards the building of strong Internet infrastructure backbone in Africa. The overall aim is to provide affordable Internet access and connectivity through the implementation of national and regional Internet exchange points plus any other critical infrastructure projects identified during the feasibility study and endorsed for implementation. The project will identify technical expertise respecting the spirit of technical cooperation among developing countries in which successful experiences and best practices from other developing regions will serve as models of transformation, supported by flourishing public and private partnerships. Project activities will strengthen the capacity of stakeholders to assess the key challenges, opportunities and constraints stemming from the establishment of the Information Society. The project will also facilitate the formulation of conducive policies aimed at stimulating the implementation of ICTs for universal access, and the	Africa 2007

			forging of mechanisms that may help countries to leap-frog into the information society through new technologies. Overall, the project will benefit all the regions of the developing world. While Africa's improved Internet connectivity will be the main focus, other regions will benefit in the process by drawing lessons from the African situation for further improving their own connectivity, and enjoy other regions will benefit in the process by drawing lessons from the African situation for further improving their own connectivity, and enjoy other benefits accruing from the improved access. [...] **Feasibility Studies for Connecting Africa** **ITU (International Telecommunication Union)** In close collaboration with public and private sector, regional and international organizations and African countries, within the framework of this project the ITU intends to conduct feasibility studies and develop project documents aimed at investment for laying out broadband infrastructure within [...] **Strengthening the Capacity of Parliaments in Africa to harness Information and Communication Technologies (ICT)** **UNDESA (United Nations Department for Economic and Social Affairs)** The project aims at building the capacity of African parliamentary administrations in the area of legislation, information, research, documentation and technologies and at establishing a network to facilitate the sharing of experiences and best practices. The activities of the project include the [...] **CMMI guide/ Software Process Improvement (SPI)** **INDUSTRIAL MODERNISATION CENTRE** Building the capacity of local IT SMEs IT to prepare them to embark on acquiring the	Africa 2007 Africa 2007

			CMMI framework if needed and be qualified to participate in exporting products and services and become reliable partners while cooperating with international offshore enter	Egypt 2007
			ICT4NGO **Abou Bakr Al Seddik Association** The objective of this grant is to enhance the capabilities of a minimum of 120 NGOs in 6 govoranates through the application of ICT. The program is being implemented in the following governorates: Sohag, Minia, Port Said and Luxor, Gharbeya and Fayoum. The Umbrella NGOs will provide each NGO [...]	Egypt 2007
			Lagos Digital Village – A Village Among Us **Lagos Digital Village** The Lagos Digital Village, located at the New Library Building in Ebute Metta (Lagos, Nigeria), is an Information Technology training and opportunity centre for Nigeria's youth. The vision of the village is to raise "a new generation of Nigerian youth who are well equipped with appropriate [...]	
			'One Dollar for Development' **FORMIT Foundation** ODFD initiative aims at making available at no cost e-Government applications owned by developed countries to developing countries by encouraging the North-South and South-South cooperation as an effective contribution to development and as a means to share and transfer good practices and [...]	Nigeria 2006 Developin

			New Regional Centre in Tunisia to Help Youth Participate in the Knowledge Economy Microsoft Corporation UNESCO and Microsoft Corp, in cooperation with the Youth Observatory of the Tunisian Ministry of Youth, will inaugurate the InfoYouth Centre, a regional community technology centre for North Africa, designed to provide youth with access to, and skills training in, the information technologies (IT). [...] East Africa E-Government Academy Jomo Kenyatta University of Agriculture & Technology (JKUAT) Jomo Kenyatta University of Agriculture and Technology (JKUAT) in collaboration with a private company Circuits & Packets Communications Ltd is working on a project under the framework of the decisions of WSIS Summit to deliver tailor made E-Government Training targeted at Governments endeavouring [...] AL-HILAL DIGITAL COLLECTION Bibliotheca Alexandrina Introduction The Digital Library of The Modern History of Egypt is a cornerstone of Bibliotheca Alexandrina's (BA) integrated digital library. It is designed to include collections of specialized libraries belonging to eminent Egyptian politicians, authors and historians as well as content from [...] telecentre.org International Development Research Centre (IDRC)	g countries 2006 Tunisia 2006 Kenya 2006 Egypt 2006

			telecentre.org is a collaborative initiative connecting telecentres, networks, innovators, social investors and other interested groups who believe that information and communications technology, used locally, strengthens individuals and the communities where they live. Hosted by Canada's [...]	International 2006
			Foster partnership program on ICTs for equitable and self-sustainable development. ITU (International Telecommunication Union) Navajo Nation, OCCAM and ITU will build a non-exclusive partnership program, in order to: - Ensure ICTs access for indigenous groups, through a multilingual and global portal - Enhance mutual support and collaboration between the Parties through actions, projects and programmes with emphasis on [...]	International 2006
			IsAP Project Regional Initiative to facilitate and promote telecommunication development in Indigenous Communities in the Americas Region. ITU (International Telecommunication Union) The Indigenous communities include women and young people who are facing one of the lowest levels of discrimination and poverty in the world. Within the framework of the special initiative of Assistance to Indigenous People the ITUBDT has advanced important steps towards the development of the ICTs [...]	International 2006
			The NEPAD e-Schools Initiative NEPAD e-Africa Commission African youth are the pillar upon which the African future economy is built. In order to ensure that African communities of the future have the skills required to function in the information society and knowledge economy , the NEPAD e-Africa Commission	South Africa

			launched the NEPAD e-Schools Initiative with [...]	2006
			TrainForTrade programme UNCTAD (United Nations Conference on Trade and Development) UNCTAD, through its TrainForTrade programme, implements a distance learning strategy to deliver training and capacity building in the areas of trade, investment and development with a focus on LDCs. UNCTAD distance learning activities deliver high quality training materials developed using a [...]	International 2004
			ICT Advocacy and use among the Less privaledged communities in Zambia Zambia Association For the Advancement of ICT SUMMARY Zambia Association for Advancement of Information and Communication Technologies (ZAA-ICTP) 1. Address: Private bag, 195X Ridgeway, Premium House 2. Location: Lusaka, Zambia 3. Year established: 2004 4. Legal status: Non governmental organisation 5. Reg. No. ORS 102/35/3135 6. [...]	Zambia 2005
			it@ab - Installation of an advisory network InWEnt – Internationale Weiterbildung und Entwicklung gGmbH on behalf of Federal Ministry for Economic Cooperation and Development (BMZ) Within the seven participating countries an advisory network has been installed. The network connects the SADC region and particulary fosters the development of small and medium sized entreprises (SMEs) and the establishment of business start ups in the ICT sector. The project comprises four [...]	SADC 2005
			African Virtual University, Phase II	

			Canadian International Development Agency In 1995, the World Bank initiated the preparation of the African Virtual University, a satellite-based distance education project whose objectives are to deliver university education in the disciplines of science and engineering, non-credit/continuing education programs and remedial instruction to [...] International Trade and Sustainable Development: Accessing Information on WTO, NEPAD, ACP–EU Agreements for Civil Society Organizations in Nigeria. Development Information Network The CSO Working Group on Globalization, Trade and Sustainable Development (TSD-Nigeria) is a platform for articulating CSO inputs into the Nigerian, Regional and Global Trade Agenda. It was formed in May 2004 by participants at a series of National Stakeholders Workshops held across the country [...] Africa Civil Society Forum The African Civil Society for the Information Society - ACSIS The Forum had the following objectives/outputs: A: Capacity Building/Training B: Issue Statements & Strategies for effective civil society inputs C: Organizational & Structural Issues The issues included: • An overview of civil society engagement in national, regional and [...] WSIS African Academia Research Network (ARN) UNECA (Economic Commission for Africa) The Network was launched by ECA with support from Ford Foundation during WSIS Geneva 2003. ARN provides a space for a select group of leading African academics and researchers to reflect on key research questions and activities in ICTs, policy and	International 2005 Nigeria 2005 International 2005 International

			society. A three-day brainstorming meeting of the [...]	2005
			Harnessing ICTs for the audiovisual industry and public service broadcasting in developing countries UNESCO (United Nations Educational, Scientific and Cultural Organization) The project "Harnessing ICTs for the audiovisual industry and public service broadcasting in developing countries" aims to advise developing countries in Africa, Asia and Latin America in the potentials of ICT-enhanced broadcasting, both in their audiovisual industry and public service [...]	International 2005
			United Nations Health InterNetwork WHO (World Health Organisation) Health InterNetwork is one of four major initiatives of the UN Millennium Action Plan. It aims to bridge the digital divide in health by providing access to high quality, timely information for health professionals, researchers and policy makers in developing countries, using the internet. The core [...]	International 2004
			Developing ICT human resource development strategy Ethiopian Information and Communication Development Authority The ICT human resource development requirement of the country is studied. Based on the results of the study, there is a critical need for developing a human resource capital for ICT development in the country. Therefore, a strategy for planning and guiding the human resource development endeavour is [...]	Ethiopia 2004

IDRIS -	580	190	Not all could be presented here. Only a few taken for representation.	
Social innovation, human development	90	32	**Natural Resource Use, Rural Development and Environmental Governance - Phase III** **University of Zimbabwe** Two previous phases of this project successfully drew attention to policy issues in the use and management of natural resources in Zimbabwe. The project investigated the feasibility and socioeconomic implications of devolving authority over natural resources to the local level, and contributed to national policies and programs. The CAMPFIRE program, in particular, is a pioneering initiative aimed at community-based wildlife management and alleviation of rural poverty. In addition to helping local communities manage their own natural resources, the program attracted social scientists and students from Zimbabwe and the region to study the social dimension of natural resource management. Through a degree-granting program, it built up a significant body of researchers and teaching staff on natural resource issues. It also stimulated innovative capacity on the part of researchers, policymakers and local communities in neighbouring countries, such as Mozambique. This phase of the project will consolidate these achievements, placing greater emphasis on regional outreach. It will also concentrate on attaining financial and institutional sustainability through the establishment of a trust for more effective and efficient grant and contract management.	Zimbabwe 2001
Capacity Building for ICTs	66	22	**Project Development : Implementation of the Mozambican Science, Technology and Innovation Strategy** **International Development Research Centre** **Mozambique. Ministry of Science and Technology** This grant will allow a consultant, Mr Peter Greenwood, to conduct an evaluation of	Mozambique 2010

			the implementation of the Mozambican Science, Technology and Innovation Strategy (MOSTIS); evaluate the country's information and communication technology (ICT) policy (ICTs make a key contribution to the implementation of MOSTIS); and explore the feasibility of establishing a multi-disciplinary scientific and industrial research agency to harness science and technology for use by both large- and small-scale industries. The aim of the exercise is to produce a final project proposal with the broad goal of strengthening the implementation of MOSTIS, primarily through research and capacity building. **Capacity Development to Strengthen Geospatial Research within Acacia Projects** **International Development Research Centre** More and more communities, governments and nongovernmental organizations are using geographic information systems (GIS) to respond to their mandates and activities. Moreover, the recent phenomenon of online community sharing and collaboration has made it possible for non-expert users to appropriate, combine and customize spatial data solutions to problems, often at a very local level. The phenomenon has implications for development, particularly in the areas of land use planning, health and health care, and mapping such things as poverty and crime. IDRC's Acacia initiative works with African partners to help African countries apply information and communication technologies (ICTs) to social and economic development. This grant will allow Acacia research partners to learn how geospatial data collection, analysis and representation could be used to enhance their work. **Capacity Building in Open Medical Record System (OpenMRS) in Rwanda** **Partners in Health** The Government of Rwanda recognizes that information and communication technologies (ICTs) have the potential to allow the Ministry of Health to collect health information more effectively and allocate resources more efficiently, thereby improving health service delivery. Partners in Health (PIH), an international	International 2011 Rwanda 2011

			nongovernmental organization, has demonstrated the usefulness of an open source electronic medical record system (OpenMRS) at six clinical sites in Rwanda. The Ministry has decided to roll out OpenMRS nationally to track patient-level medical information for improved healthcare delivery. Two institutions - PIH and the Ministry of Health/Treatment and Research AIDs Centre (MoH/TRAC) - have been asked to spearhead the process. Rolling out OpenMRS will, however, require significant human resources to ensure that the country can maintain the system without outside help and on a sustainable basis. This grant will support the first stage of an intensive and cyclical training program for Rwandan junior programmers and students, to be implemented by PIH and MoH/TRAC in collaboration with the Rwanda Information Technology Authority (RITA) and two local academic institutions: the National University of Rwanda (NUR) and the Kigali Institute of Technology (KIST). The program will involve a mentoring process by highly-qualified computer programmers and distance learning. Project outputs will include at least three customized OpenMRS modules addressing MoH needs; nine highly skilled local programmers to act as mentors; the pilot of a robust OpenMRS program with multiple mentors and teams of trainees; and a document incorporating experiences, lessons learned and recommendations from the pilot to guide the scale-up effort. **Training Program for Volunteers in Community Multimedia Centres (Sénégal)** UNESCO The Community Multimedia Centres (CMC) initiative was launched in Geneva in 2003 during the first phase of the World Summit on the Information Society (WSIS). The project seeks to reduce the Digital Divide, facilitate access and appropriation of information and communication technology (ICT), and reduce poverty by building communities' capacity to resolve the problems that face them. The originality of the project lies in the fact that it combines both radio and access to ICTs under the same roof. This activity is part of the large-scale rollout of the project in Sénégal, which will see a network of 20 CMCs established within two years. Two villages that are part of	Senegal 2007

			an IDRC-supported Acacia (Communities and the Information Society) project (100735) are to be CMC sites, Thiel and Ranérou. This grant will support a workshop on methodology and four training sessions for volunteers at the two sites. **Harambee : Reinforcing African Voices through Collaboration** The benefits and value-added of working collaboratively have been demonstrated in the development of software by the open source community. But how can networks and communities of practice leverage existing and new knowledge on processes and technologies in support of more effective collaboration? This project intends to build on existing experiences in designing and implementing collaborative processes and technologies. It proposes to implement network strengthening activities including but not limited to capacity building, knowledge sharing, and the development of research and training materials. Immediate beneficiaries of the project will be facilitators or coordinators of several networks focused on information and communication technologies (ICTs) and knowledge for development in Africa; facilitators or coordinators of up to 10 sectoral-based networks and communities of practice in Africa; and staff of organizations currently supporting capacity development in the areas identified in the project objectives, including the project proponents. **Research ICT Africa - Phase II** **University of the Witwatersrand** This project will build on the gains achieved in terms of partnerships and capacity-building under project, "101584 Development of an African ICT Policy Research Network." The grant will allow Research ICT Africa to consolidate and extend the development of a rigorous and relevant African information and communications technology (ICT) policy research base that will allow governments to make informed decisions leading to widespread diffusion of ICTs and the reduction of the Digital Divide. The research will address the broad nexus of social, economic, gender and development issues surrounding ICTs in Africa, including infrastructure development, policy and regulation. One of the outputs of Phase I was a postgraduate program,	International 2008 South Africa 2008

			Master of Management in ICT Policy and Regulation, established in collaboration with the African training network, NetTel. This phase will develop a PhD program.	
			Gender Research in Africa into ICTs for Empowerment **Association for Progressive Communications [US]** **Research for the Future CC** This project aims to understand how women in Africa use information and communications technology (ICT) for their own empowerment. At the same time, it will seek further understanding of the concepts of "gender" and "empowerment" in the African context. The project will comprise 15 sub-projects (14 sites in 12 countries), and include a strong capacity building and mentoring component. A workshop will be held in early 2005 at which the researchers will consolidate their methodological approaches, learn how to use a qualitative analysis tool (Nvivo) and improve their ICT skills. User-friendly online collaboration platforms will be developed and supported. The results will be documented in a professionally edited online and printed publication. The project is expected to generate site-specific recommendations, which will be shared with policymakers and educators, and a network of gender and ICT researchers in Africa.	International 2008
			Defining Local Content and Appropriate Information Tools for Rural Development (Ghana) Ghana Information Network for Knowledge Sharing Information and communication technologies (ICTs) can only contribute to development if the information they convey is local and relevant to the needs of the communities in which they are deployed. This action-research project will endeavour to enhance information and knowledge sharing between underprivileged communities in Ghana. It will do so by developing relevant local content in a participatory manner	Ghana 2007

			and disseminating it using appropriate tools, such as the Internet, CD-ROM, cellular telephone, digital video and voice playback. The project will focus on women food producers in Mfantsiman, one of the poorest districts in Central Ghana, and take a case study approach. Researchers will gather quantitative and qualitative data by means of face-to-face interviews, focus group discussions, walks through the community and day-in-the-life series.	
			Capacity-building for Community Wireless Connectivity in Africa **Association for Progressive Communications [US]** The high cost of conventional "wired" infrastructure is an obstacle to those looking to harness the potential of information and communications technologies (ICTs) for development and social change. Wireless fidelity (WiFi), on the other hand, offers tested, low-cost options to complement conventional infrastructure, for example, making use of unlicensed radio spectrum to deliver fast Internet access. This project aims to empower communities and individuals in Africa to harness the potential of ICTs for development and social change through WiFi. It will do so through capacity building, training materials development, knowledge networking, information dissemination and general awareness raising in selected regions in Africa.	Africa 2006
			Information and Communication Technology and the Media : Closing the Loop **FAHAMU Limited** The Science Development Network, SciDev.net, organized a regional meeting in Entebbe in November 2002 to address the issue of building the capacity of journalists to report on scientific research. Following the meeting, IDRC discussed the way forward with a number of media professionals. It transpired that journalists and media people need training in scientific reporting - both to inform and to advocate - and in using information and communication technologies (ICTs) as tools for development. This grant will support a survey (needs analysis) of ICT capabilities among journalists	Africa 2005

			in Kenya, Rwanda, Tanzania and Uganda; an online course for journalists and media workers (JustWrite, based on the earlier Writing for Change); and the linking of participants (up to 25 from each country) in an online community, moderated by a tutor. **Public Access Strategies: Enhancing ICT Services in Telecentres (Mozambique)** **University Eduardo Mondlane** Based on the results of previous research (003728/97-8908 and 004227/98-8904), it is apparent that the provision of telecentres and information and communication technologies (ICTs) is not enough to ensure the adoption of these services by individuals and communities. Further effort is required to help communities utilize new communications services to their own benefit. This project will examine the application of ICTs in telecentres and investigate expanding and extending them in such a way that even the poorest communities can benefit. Researchers will identify the existing and new ICT services that best meet the needs of impoverished communities; identify ways of providing these services at an affordable cost; implement new ICT services in one or more telecentres; measure the impact of these services on poverty alleviation; and transfer skills from the consultants to the project team. **Strengthening the Productive Capacity of Youth and Women Returnees** **Canadian Physicians for Aid & Relief** Uganda has emerged from a decade of destructive conflict and still suffers from extreme poverty in many regions. Northern Uganda was particularly affected, with over 700 000 people internally displaced. In this region, the burden of war and suffering has been borne by women and young people, who have been the targets of abduction, captivity and even sexual abuse. Many lost family property, necessitating a change of gender roles and new skills to find other livelihoods. This project aims to apply	Mozambique 2005 Uganda 2005

			information and communication technologies (ICTs) to enhance the reintegration and improve the livelihoods of young people and women whose lives were devastated by the civil war. It will do so by integrating ICTs into existing economic activities, and applying them to vocational skills training; counselling, mental health and trauma healing; income generating activities (credit, agriculture, business); and peace-building. The research element of the project will investigate how ICTs can add value to the new roles that women and orphans have assumed, and how they can be used to improve business and marketing opportunities and skills. The project will be based at the main community learning centre in Lira Town, and provide outreach to three other centres at Loro, Ngai and Otwal.	
			Popular organizations and ICTs: economic footing - Phase II **Environmental Development Action in the Third World** Recent economic reforms implemented in African countries have admittedly caused a deterioration in the living standards of the most disadvantaged. But they have brought about social changes that have given rise to self-organizational skills. Grassroots organizations play an increasingly important role in the social dynamics of finding solutions to impoverishment through by providing basic services accessible to the poorest at low cost. Information and communication technologies (ICTs) may be one response to the demand of popular organizations for an improvement in their capacity to fight poverty. That is what the pilot project phase (065198/97-8151) attempted to show with the creation of community resource centres in highly unstable areas in urban and outlying communities of Dakar, Sénégal. From the results obtained, it was possible to identify entry points for change suitable for reinforcement. This new phase is designed to help sustain the process, and available human, technical and financial resources, to ensure the long-term use of ICTs to support local development.	Senegal 2004
			Lubisi Project : use of innovative ICTs and content development **Council for Scientific and Industrial Research [ZA]**	South Africa 2002

			As competitive industries in the industrialized countries move quickly to adopt information and communication technologies (ICTs) and electronic commerce, their counterparts in less developed economies face a double challenge: to weed out ingrained structural inefficiency and to catch up on the e-commerce front. In Africa, there is a need to understand how to enable particular groups of firms (in this case, small and medium enterprises (SMEs) that are participants in industrial supply chains) to respond to the competitive challenge posed by e-commerce. Such better understanding is needed to help shape public policy (on e-commerce and industrial development), business support services and (in the particular case of South Africa) strategy development in the information technology sector. This project will undertake the first empirical research in Africa in this area. Researchers will examine the impact of ITCs on international competitiveness and supply chain management in developing countries at both the intra- and inter-firm levels. The methodology will entail a literature review (electronic and print); an analysis to frame issues; workshops and focus groups to generate primary data on firms of varying sizes; quantitative and qualitative analyses of the data gathered; validation of results; and dissemination of the results to policymakers and stakeholders, including the participating firms themselves. **Strengthening the Productive Capacity of Youth and Women Returnees** **Canadian Physicians for Aid & Relief** Uganda has emerged from a decade of destructive conflict and still suffers from extreme poverty in many regions. Northern Uganda was particularly affected, with over 700 000 people internally displaced. In this region, the burden of war and suffering has been borne by women and young people, who have been the targets of abduction, captivity and even sexual abuse. Many lost family property, necessitating a change of gender roles and new skills to find other livelihoods. This project aims to apply information and communication technologies (ICTs) to enhance the reintegration and improve the livelihoods of young people and women whose lives were devastated by the civil war. It will do so by integrating ICTs into existing economic activities, and applying them to vocational skills training; counselling, mental health and trauma healing; income generating activities (credit, agriculture, business); and peace-building.	Uganda 2002

			The research element of the project will investigate how ICTs can add value to the new roles that women and orphans have assumed, and how they can be used to improve business and marketing opportunities and skills. The project will be based at the main community learning centre in Lira Town, and provide outreach to three other centres at Loro, Ngai and Otwal. **Economic Empowerment of Women through ICTs in Uganda** **Council for the Economic Empowerment for Women in Africa** Small and medium enterprises (SMEs) make a significant contribution to the economy of Uganda. Over 45% of SMEs are owned and operated by women entrepreneurs in such sectors as beverage production (16%), textiles (9%), services (9%), and retail and trade (66%). A recent consultative workshop held by the Council for the Economic Empowerment for Women in Africa revealed that the productivity of enterprises operated by women is hampered by lack of access to information on resources, markets and support services. This project will establish an information and communication technology (ICT) infrastructure, in the form of the Women's Information Resource and Electronic Service (WIRES), in Kampala and connect it to two rural sites, Nabweru and Buwama. This will give women entrepreneurs access to simplified and repackaged information relevant to the development of entrepreneurial skills and the expansion of their existing enterprises. A training component will ensure that the required human resource capacity for the sustainability of the project is developed. It is expected that the project will demonstrate and elucidate the contribution that ICTs can make to trade and commerce. **Environmental Learning in Communities and Schools in Eastern and Southern Africa** **EcoNews Africa**	Uganda 1999 South Africa 1998

			This project will examine environmental learning (EL) as an approach that integrates formal, informal, and nonformal learning processes and scientific and indigenous knowledge systems to inculcate environmental knowledge, skills, attitudes, values, and behaviour within schools and communities. The project will bring together key players and practitioners in selected countries of Eastern and Southern Africa to formulate and develop approaches that would make learning related to the sustainable management of the environment more effective and better coordinated while incorporating indigenous/community knowledge and experiences, and building on the strengths of women as environmental managers. **Exchange of Information and Sharing of Experiences among Communities in East and Southern Africa through Electronic Communications** **EcoNews Africa** This project aims to build the capacity of three rural communities in Kenya, Tanzania and Uganda, respectively, to access, receive, share and disseminate information and experiences for their own empowerment and development. It will set up electronic links between three resource centres and FM Radio stations that will enable each of the three to communicate, debate, consult and build solidarity, and to share their development concerns with the relevant development agents. It will also enable the communities to electronically obtain, package, repackage, exchange and share information with other communities in East and Southern Africa. The project will build capacity to carry out these tasks. It will also provide an opportunity to see how social and economic change can be effected in rural communities through the application of information and communication technologies (ICTs) to local problems. The outputs of this project will be three fully operational community electronic communication facilities and three groups of trained people capable of gathering, processing, packaging and disseminating information both within and outside their communities. In addition, institutional linkages between the participating communities, non-governmental organizations (NGOs), international institutions, media networks and policymakers will be established and enhanced. This will be accomplished through	East Africa 1998

			online circulars and bulletins, exchange visits between the three communities and improved information gathering through the use of the ICTs that will be in place. **Community Empowerment through the Use of Information and Communication Technologies** **Uganda National Council for Science and Technology** Recognizing the potential of information and communication technologies (ICTs) to transform rural communities both socially and economically, the government of Uganda is committed to extending the telecommunications infrastructure and expanding access to telecommunications services to all parts of the country. In view of this, IDRC has identified Uganda as one of the countries to spearhead the implementation of an Acacia national strategy. Acacia is an international effort to empower Sub-Saharan African communities to apply ICTs to their own development. This project will launch the Acacia Strategy for Uganda. The project team will conduct a feasibility study to determine suitable sites for "telecentres"; design the telecentres, and acquire and install equipment; and operationalize the telecentres by training operators and end-users, developing appropriate content and creating mechanisms of financing. Expected outcomes of this project are as follows: two or more functional telecentres; local capacity to use ICTs; knowledge regarding the key to the successful implementation of telecentres; enhanced awareness of the potential of ICTs in rural community development; and some income and employment from ICT-related activity. Finally, the project is expected to attract private sector and other donor funding, the combined effect of which will be to accelerate community development in the participating communities. **Netc.orps and SchoolNets SA Intern Pilot Project** **International Development Research Centre** IDRC has been instrumental in developing the Netc.orps programme, now	Uganda 1998

			implemented by the Canadian International Development Agency (CIDA). It involves a consortium of youth exchange non-governmental organizations (NGOs) sending interns to various countries to help local NGOs apply information and communication technologies (ICTs) to development. The consortium includes World University Service of Canada (WUSC), Voluntary Service Overseas Canada (VSO-Canada), CUSO, Oxfam Quebec and Canada World Youth (CWY). As part of Netc.orps' programme pilot, VSO-Canada will be sending two interns to South Africa to work on the development of SchoolNets SA. Each will be attached to an organization within SchoolNets SA and will work for six months on technical support and capacity building. VSO-Canada will cover the transportation costs and general expenses of the two interns (using funds from CIDA) and the two local organisations (National Science and Technology Education Trust and Gauteng Schools Network) will provide the resources for the interns' work environment. IDRC will finance the the interns' accommodation while in Johannesburg for six months. **Incorporating Gender into the ACACIA National Strategy for Sénégal** **International Development Research Centre** In Sénégal, a national action plan for women was adopted following the Fourth World Conference on Women held in Beijing. Once of the problems the plan is intended to solve is women's limited access to information. However, all current aspects of the issue have not been explored, especially new information and communications technologies (ICTs). Accordingly, given the ACACIA Initiative's emphasis on providing women and young people with access to ICTs, it is necessary to take greater account of gender relations in the strategy established for Sénégal, one of the countries selected to test ACACIA Initiative approaches. Although women have participated in various stages of ACACIA strategy development, a gender analysis conducive to proper understanding of male-female relationships in this area is still sorely lacking. A detailed study to better identify the national stakeholders concerned has therefore been recommended. Accordingly, this 6-month project will be conducted in the hope of adopting an ICT action plan for women. The process will involve the identification of women's needs and expectations; the development of an analytical grid for gender as	South Africa 1998 Senegal 1997

			applied to ICTs; and an information/awareness campaign for women focusing on the use of ICTs as a tool for women's liberation, etc.. Project activities will be based on the dynamics between different groups, associations and networks whose members will be attending workshops at the regional and national levels. A steering committee will also be established to monitor the project. **Mozambique Acacia Advisory Committee Secretariat University Eduardo Mondlane** The Acacia initiative is an international effort to empower sub-Saharan African communities with the ability to apply information and communication technologies (ICTs) to their own social and economic development. This project will establish a Secretariat in the Office of the Vice Rector to support the Mozambique Acacia Advisory Committee (MAAC) and facilitate the implementation of the Acacia National Strategy in the country. The Secretariat will have three broad areas of responsibility: stimulating public awareness of ICTs and development issues; assisting in the identification of research and project development needs; and informing and servicing the MAAC. The Secretariat will be staffed by one technical/scientific officer and one administrative officer. Its activities will be evaluated as a modality for delivering Acacia in countries where there is no IDRC presence.	Mozambique 1997
ICTs access	148	20	**Evidence-based ICT Policy for Development and Innovation** **International Development Research Centre** **African Communication Research Institute (Association Inc. under Section 21)** The cost of access to information and communication technologies (ITCs) in Africa remains the major impediment to the participation of Africans in the networked society. While Africa is the region with the fastest growing number of mobile phone subscribers in the world, only a few African countries have gained access to such innovations for the poor as mobile money transfers and market information for marginalized farmers. Research ICT Africa (RIA) is a network of African scholars that addresses research gaps in the area of ICT policy and regulation, and has sufficient analytical capacity to inform (evidence-based) policymaking. This grant will allow RIA	Africa 2010

			to continue adapting and creating new analytical tools; training researchers in analytical skills, writing, publishing and policy advocacy; gathering data for longitudinal studies of ICT access and use; and exploring such issues as mobile money transfers, informal sector use of ICTs, expanding market competition and making affordable services available to the underserved. **ICTs for Equal Access to Human Resources in Health in Francophone Africa** **Reseau Informatique Malien d'Information et de Communication Medicale** Making use of information and communication technology (ICT) to ensure equitable access to health services in developing countries is becoming more and more feasible. Since the conference, Bridges to African Development via the Internet (Bamako, 2000), several ICT initiatives have appeared in Mali, such as the telemedicine project undertaken by REIMICOM, the Malian information network on medical information and communication, and the teleradiology project, IKON. This grant aims to better understand how ICTs can facilitate equitable distribution of health personnel. It will do so by reinforcing and consolidating ongoing research activities at CERTES, the centre for expertise and research in telemedicine and e-health, a REIMICOM project. **Reseau Informatique Malien d'Information et de Communication Medicale** The Knowledge Access in Rural Inter-connected Areas Network (KariaNet) aims to enhance the effectiveness of development projects in the Middle East and North Africa (MENA) that serve to enable the rural poor by sharing innovations, best practices and indigenous knowledge using information and communication technologies (ICTs) and knowledge management tools. The first phase of KariaNet was funded under project 102206. This phase will endeavour to expand the existing network to include two thematic networks on food security and rural enterprise, respectively. A third thematic network - on knowledge management strategies - will play an advisory and support role to the larger network. Project activities will include a call for research proposals on the aforementioned topics, action-research projects, training and dissemination	Mali 2009 West Africa 2009

			workshops, and a website. **Panafrican Research Agenda on the Pedagogical Integration of ICTs** **International Development Research Centre** **Université de Montréal** **Educational Research Network for West and Central Africa** Access to quality education for both young people and adults remains one of the most important development challenges in Africa. Information and communication technology (ICT) can help overcome educational challenges. Indeed, ICTs are increasingly present in African society and to some degree in all levels of education, both formal and nonformal. They are also being used to offer distance learning to teachers and other adults. However, while ICTs are increasingly taught as a subject, the use of ICTs to improve the quality of teaching and learning is still being explored. There is need to test and validate strategies, tools and guidelines for effectively integrating ICTs in African education systems. PanAf is a network of researchers from research centres in 12 African countries that was set up for the purpose of supporting a pan-African research agenda on the pedagogical integration of ICTs in education. In a first phase supported under project 103741, PanAf worked on improving the availability of data based on a set of 180 indicators covering policy, access, equity, teacher training, etc.. These data are available on a highly cited and visited interactive observatory of ICTs in education in Africa that can be seen at www.observatoiretic.org. This phase will go beyond issues of connectivity and access to address the integration of ICTs into learning and teaching as upheld by both theoretical and practical approaches. In addition to the observatory, researchers will examine the context and value of pedagogical changes that could transform education in Africa by providing evidence-based policy directives. **Linking African Farmers to Markets (eARN Africa)University of Nairobi** Studies suggest that information and communication technologies (ICTs) are of some	Sierra Leone 2008

			benefit to farmers, but how effective they are in linking small farmers to wider markets remains unknown. There are knowledge gaps concerning the factors conditioning farmers' adoption of ICTs, farmers' benefits from ICTs, drivers of success or failure, and best practices for achieving desired development outcomes. This project (eAgriculture Network for Africa - eARN Africa) will study the effectiveness of electronically mediated interventions in linking African farmers to markets and promoting household food security. The study will focus on smallholders in Bénin, Ghana, Kenya, Madagascar, Malawi and Uganda, where such interventions exist. In each country, researchers will gather both quantitative and qualitative data on 340 farmers stratified by participation in electronic market information services. The findings will be used to inform the scale-up and extension of successful interventions and the re-design of those that failed. **Electronic Government in Sierra Leone : Enabling Democracy and Good Governance International Records Management Trust** IDRC's Information and Communication Technologies for Development (ICT4D) program initiative has supported several research projects exploring how ICTs can improve government transparency and citizens' access to information. The way governments keep, create, use and provide access to records could reduce the opportunity for fraud, corruption and misuse of resources. Several African countries, including Sierra Leone, are currently implementing electronic record information systems in an effort to improve governance and accountability. This grant will allow ICT4D to hold a meeting of experts on e-Government, record information systems and governance - including senior civil servants and records professionals - in Ottawa with a view to deciding how best to work with African governments in this area. The meeting will seek representation from Botswana, Ghana, Kenya, Sierra Leone and Tanzania. The grant will also support the production of a discussion paper and a video on Sierra Leone's experience with computer-based transactional software. In addition to informing the discussion, the video will be used to demonstrate to a wider audience the best practices, benefits and challenges of implementing good government record-keeping. The exercise is expected to result in a research framework on understanding the potential of e-Government to reduce corruption and mismanagement, and promote	Kenya 2009 West Africa 2006

			transparency and democracy.	
			Contribution of ICTs to the Rejection of Female Genital Mutilation in Francophone West Africa Environmental Development Action in the Third World The objective of this project is to make strategic use of information and communication technology (ICT) to speed up the eradication of female genital mutilation (FGM) in francophone West Africa. The project will establish the degree to which communities have appropriated the struggle against FGM and the potential role of ICT in it. The project will be carried out in Burkina Faso, Mali and Senegal with groups of young people from communities that practice excision, have access to ICT infrastructure and in which actions against excision have been undertaken. It will sensitize young people, community leaders and the public by way of face-to-face and virtual meetings. Behavioural changes in the young people involved in the project will be documented by means of an evaluation combining Outcome Mapping and a gendered approach. The results will be disseminated to the communities concerned, including (among others) political decision-makers, institutions engaged in the prevention of FGM, institutions engaged in the promotion of ICT for development, and researchers.	Africa 2006
			Information and Communication Technologies and Small-scale Agriculture : Scoping Study **International Development Research Centre** Small-scale farming provides most of the food in Africa and employs about 60% of the workforce. But although agriculture constitutes the backbone of most African economies, agricultural productivity is dropping, mainly due to natural resource degradation, high cost of inputs, limited access to markets and the impact of HIV/AIDS. Civil society, government and private sector organizations have developed some innovative technologies and practices to modernize small-scale agriculture, but most of these do not reach the intended beneficiaries. The use of information and communication technologies (ICTs) by small farmers could help deliver critical	Egypt 2006

			knowledge, information and services to smallholders. IDRC's Acacia initiative (Communities and the Information Society in Africa) is interested in funding such a network. This grant will allow a consultant to undertake a scoping study on ICTs and small-scale agriculture (including natural resource management), and develop a project proposal for funding consideration by Acacia.	
			ICTs for Micro, Small and Medium Enterprise Development in Egypt Competitiveness on the part of Egyptian enterprises is regarded as one of the key factors in the country's economic development. Egypt has a large number of small, micro and medium enterprises (SMMEs) that are unable to compete in a global context where knowledge counts more than physical capital or natural resources. This grant will allow the Egyptian Ministry of Information and Communication Technologies (ICTs) to undertake a series of actions to help SMMEs appropriate ICTs and to use them wisely in ways that meet their needs. From this experience, researchers will draw the best strategies and approaches to learning, as well as tools for evaluating the appropriation of ICTs by SMMEs. The ultimate goal is to allow MPMEs to become more competitive and effective on the national and international scene, and to generate more employment.	Senegal 2006
			Integration of ICTs in Local Government in Senegal **International Development Research Centre** This project is being carried out within the context of the action plan resulting from the World Summit on the Information Society (WSIS). The plan, among other things, stresses the need for public-private partnership if African communities are to gain access to information and communication technology (ICT) to stimulate their economic and social development. The project is a joint initiative of Alcatel, IDRC and UNCDF (United Nations Capital Development Fund). It consists of a pilot project integrating	Ghana 2005

			ICT applications and services within the process of decentralization and local governance in Sénégal. The project will be carried out in eight rural communities in two departments (Kaffrine et Kébémer), corresponding to UNCDF zones of intervention, by a multidisciplinary team of researchers from the information processing laboratory of the Ecole supérieure polytechnique de Dakar. The pilot project should provide the basic information necessary for an extension of the experiment in space (replicability) and time (sustainability). **ICTs for Political Inclusion and Good Governance in Northern Ghana** **International Development Research Centre** The legitimacy and survival of an emerging democracy such as Ghana depends very much on the extent to which it allows political inclusion and grassroots participation. Political inclusion refers here to making it possible for citizens to be part of the decision-making process with a view to improving their socioeconomic circumstances. Political inclusion is a serious challenge in regions like Northern Ghana, which is characterized by endemic poverty, illiteracy and poor communications. Lack of access to information and knowledge keeps many stakeholders from participating in the political process. This project will explore the role that information and communication technology (ICT) can play in promoting broad political inclusion and good governance practices. Researchers will carry out a baseline study that will inform a pilot intervention on the use of ICT in local governance. The project will work in close collaboration with community-based organizations (CBOs) and nongovernmental organizations (NGOs) engaged in development issues. The intervention will be assessed and lessons drawn for possible replication, and to inform policies and strategies aimed at promoting good governance through the use of ICTs. **Defining Local Content and Appropriate Information Tools for Rural Development (Ghana)** **Ghana Information Network for Knowledge Sharing**	Ghana 2005 Southern Africa 2004

			Information and communication technologies (ICTs) can only contribute to development if the information they convey is local and relevant to the needs of the communities in which they are deployed. This action-research project will endeavour to enhance information and knowledge sharing between underprivileged communities in Ghana. It will do so by developing relevant local content in a participatory manner and disseminating it using appropriate tools, such as the Internet, CD-ROM, cellular telephone, digital video and voice playback. The project will focus on women food producers in Mfantsiman, one of the poorest districts in Central Ghana, and take a case study approach. Researchers will gather quantitative and qualitative data by means of face-to-face interviews, focus group discussions, walks through the community and day-in-the-life series. **Application of ICTs in the HIV/AIDS Response in Eastern and Southern Africa** **AFRIAFYA** HIV/AIDS has become the most significant health and development challenge facing sub-Saharan Africa. This project will examine how information and communication technologies (ICTs) have been used to address the challenge of HIV/AIDS in five countries in Eastern and Southern Africa: Botswana, Kenya, South Africa, Tanzania and Uganda. Researchers will seek answers to the following three questions: To what extent has the policy environment in each country hindered or promoted the application of ICTs in HIV/AIDS programs? How have ICTs been used to increase access to HIV/AIDS treatment, care and prevention? How have ICTs been used to mitigate the effects of HIV/AIDS on communities? The project is expected to identify "best practices" and provide policy recommendations for national HIV/AIDS programs in the region. **First Connectivity Africa Advisory Committee Meeting (Mauritius)** **International Development Research Centre** Catalysing Access to ICTs in Africa (CATIA) and Connectivity Africa both came out of the Group of Eight Digital Opportunity Taskforce (G8 DOT Force) and share a common aim: improving access to information and communication technologies	Mauritius 2004 West

			(ICTs) in support of social and economic development in Africa. But while CATIA focuses on policy reform, Connectivity Africa is concerned with the implementation of ICTs. This grant will support a joint advisory committee to provide the two programs with strategic advice, maximize synergies and avoid duplication. **ROCARE: Study on ICT and Education** **Réseau Ouest et Centre Africain de Recherche en Éducation [BJ]** **Université de Montréal** Despite all the investment that has gone into improving their educational systems, African countries continue to face many challenges related to school access and retention, as well to the quality of teaching provided. This project aims to better understand the conditions likely to foster the integration of information and communications technologies (ICTs) in African schools in order to contribute to the development of education. The research methodology to be used in this project will be the multi-case study focussing on the similarities and individual characteristics of the cases studied. Care will be taken to ensure that the chosen sample covers the diversity of school settings, including primary/secondary, rural/urban, public/private, mixed/non-mixed and privileged/underprivileged. The research results will help to better inform policies and practices on the integration of ICTs in education. **Public Access Strategies: Enhancing ICT Services in Telecentres (Mozambique)** **University Eduardo Mondlane** Based on the results of previous research (003728/97-8908 and 004227/98-8904), it is apparent that the provision of telecentres and information and communication technologies (ICTs) is not enough to ensure the adoption of these services by individuals and communities. Further effort is required to help communities utilize new communications services to their own benefit. This project will examine the application of ICTs in telecentres and investigate expanding and extending them in such a way that even the poorest communities can benefit. Researchers will identify the existing and new ICT services that best meet the needs of impoverished communities; identify ways	Africa 2003 Mozambique 2003 Uganda 2002

			of providing these services at an affordable cost; implement new ICT services in one or more telecentres; measure the impact of these services on poverty alleviation; and transfer skills from the consultants to the project team. **Establishment of a National Network of Community Multi-media Centres** **Uganda National Commission for UNESCO** New information and communication technologies (ICTs) can play a key role in resolving community problems in developing countries. Multipurpose community telecentres offer basic telecommunication and office administration services such as telephone, fax, e-mail, Internet, word processing and photocopying, along with user support and training. Well-established telecentre projects could gain greater outreach through broadcasting, while existing radio projects could benefit from ICTs. Combining the two models could help overcome linguistic, literacy and other barriers that prevent disadvantaged communities from engaging in and benefiting from the exchange of information. This pilot project will allow four established multipurpose community telecentres and two community FM radio stations in Uganda to be converted into community multi-media centres (CMCs) and linked to create a national CMC network. The CMC model will attempt to revise and build on the notion of universal access to include a number of neglected factors, such as multilingualism of content and the strengthening of the public domain, as channels for the participatory and inclusive development. **Project Development: Youth Leadership Program** **International Development Research Centre** The Youth Leadership Programme for Information and Communication Technologies and Community Development in Africa (ALPID) arose from the realization that lack of access to existing information and communication technology (ICT) will further marginalize Africa as it enters the 21st century. The principle objective of the program is to use skilled youth volunteers to train and popularize the use of ICTs in various	East Africa 2001

			producer, service and administrative communities in Africa. This grant will support the development of a comprehensive project document for the ALPID Program, to be tabled for discussion by key stakeholders. A lead consultant and research assistant will be retained to undertake a rapid assessment of the ICT environment and similar youth initiatives in the target countries. The review will be carried out in consultation with relevant government ministries, nongovernmental organizations (NGOs), research institutions and like-minded donors involved with ICTs and youth programs. A final project proposal will be submitted for funding as a second phase of the ALPID Program.	Senegal 2001
			ICTs and the Employment of People with Disabilities **International Development Research Centre** In Sénégal, as elsewhere in Africa, the disabled face enormous difficulties of social and labour market insertion because of discrimination and, especially, physical obstacles to workplaces and transportation, lack of aural or visual signalling, etc.. As a result, many disabled persons are forced into a life of begging and juvenile delinquency (prostitution, drug trafficking and drug abuse) in order to survive. Today, however, new information and communication technologies (ICTs) allow access to new services, provided one has access to a telecommunications network and the right hardware. The obstacles traditionally linked to the reduced mobility of the disabled thus become easily surmountable. This project is designed to combat the workforce exclusion generally experienced by the disabled and to promote their insertion into social life and the labour market through the exploration and implementation of telework opportunities adapted to their functional disabilities. Emphasis will also be placed on the development of a gateway website on the training and employment of the disabled. As well, this site will provide them with e-commerce opportunities through the virtual display of the handicrafts, art and services of their associations. It is anticipated that the results of the project will promote improvement in the legislation governing employment of the disabled.	South Africa 1998

			Computer Recycling **International Development Research Centre** Computers and related peripheral equipment are urgently needed in schools and rural telecentres in the South African townships. The Universal Services Agency (USA), whose mandate is to extend connectivity and access to ICTs to rural communities, is establishing an infrastructure to collect, refurbish and deploy computers in these communities. This grant will support a joint program between Canada and South Africa to recycle compatible, operational computer equipment. Once the program has been successfully launched in South Africa, the USA has agreed to work with IDRC's information and communication initiative for Africa (Acacia) to introduce similar programs in other countries. Acacia has already signed a memorandum of understanding with the Information Technology Association of Canada (ITAC) to promote a computer recycling program among ITAC's 1 500 corporate members. Discussions are also underway with Industry Canada ("Computers for Schools"), Nortel ("Telephone Pioneers") and CODE Canada, all of whom operate computer recycling programs either in Canada or abroad. The aim of the discussions is to persuade them to link their infrastructure to that of South Africa.	

Appendix B: Analysis of ICT Projects in Africa

WSIS STOCKTAKING & PARTNERSHIPS: ACTIVITY DETAILS

Taxonomy of ICT based projects in Africa

S no	Project Name	Innovation Origination/ lead	Target location/ beneficiary and year	Intervention	Addressed Theme
1	Capacity-building for Community Wireless Connectivity in Africa	Association for Progressive Communications	Africa 2006	Establishing wireless ICT infrastructure: Making use of unlicensed radio spectrum to deliver fast internet access	-Reducing access cost with WiFi as an alternative to cable networks – -to empower communities and individuals

		[US]			in Africa to harness the potentials of ICTs for development and social change.
2	Internet-Based Environment Information System	ITU (International Telecommunication Union)	Gambia, Ghana, Guinea, Kenya, Mali, Mauritania, Morocco, Niger, Uganda, Zambia 2008	Delivery and installation of one PC per country, equipped with a custom-designed SISEI environmental management portal in English or French, accompanied with the training of personnel.	ICT Application for a developmental aspect – **Artefact-technocentricity**
3	Strengthening African Capacity for Cost-Effective Access to the Internet	ITU (International Telecommunication Union)	Africa 2007	Building of a strong Internet infrastructure backbone in Africa	Reducing access cost by providing affordable Internet access and connectivity through the implementation of national and regional Internet exchange points
4	Exchange of Information and Sharing of Experiences among Communities in East and Southern Africa through Electronic Communications	EcoNews Africa	Tanzania,Kenya, Uganda 1998	Setting up electronic links between telecentres and FM Radio stations	Build capacity of the rural communities in Tz, Ky, Ug to access, receive, share and disseminate information and experiences on their development concerns with the relevant development agents.
5	Global Capacity Building Initiative(GCBI)	The World Bank and infoDev, working in a partnership with the ITU	Universities and regulatory associations in COMESA 2007	offer training and capacity building opportunities to regulatory staff across Africa.	Regulatory capacity
6	Evidence-based ICT Policy for Development	**International Development**	Africa 2010	**Train researchers in analytical tools and skills**	Building capacity for ICT-Policy research, with high cost of access in

	and Innovation	**Research Centre African Communication Research Institute (Association Inc. under Section 21)**			Africa as the main concern
7	Lagos Digital Village – A Village Among Us	The project is a multi-stakeholder partnership between Junior Achievement of Nigeria (www.janigeria.org), Microsoft (www.microsoft.com) and the Lagos State Government (www.lagosstate.gov .ng),	**Nigeria 2006**	Training is the Lagos Digital Village's platform for impact –	- provide capacity building, mentorship and opportunities -Focused on 'raising' a generation of ICT savy youth. -bridging digital divide
8	e-agriculture project	**Gedaref digital city organization GDCO**	**SUDAN 2007**	-Deployment of computers -Training of engineers in computers -development of the farmers database - Determining the geographical coordinates of the farms - Designing a web portal for the crops prices www.gedaref.com/markets	-Public Private Partnership -Modernization of agricultural practices -involved engineers as the project drivers -Farmers are the driven partners
9	Information and Communication Technologies and Small-scale Agriculture : Scoping Study	International Development Research Centre	Egypt 2006	-challenging the small scale agriculture 'modernization' efforts which show no satisfactory results. -questioning on how best to curb natural resources degradation	-Linking ICT to small scale agriculture which employ more than 60% of the workforce in Africa
10	Mobile Internet Unit	Egyptian government	Egypt 2010	- The Mobile Internet Unit, a vehicle that is equipped with computers that travel to remote areas to provide access to technology and entrance to cyberspace	- to expose rural and remote communities to ICT by providing access points, - demonstrating capabilities of computer and internet technology

11	Cyber Peace Initiative	The Suzanne Mubarak Women's International Peace Movement	Egypt 2007	- improving communications across cultural and geographical barriers through content development, platform creativity, by exploring the socio political impact of IT enabled industries, exploring in depth ICT as a channel for economic opportunities and innovation for youth, and by engaging youth in securing the Internet as the medium through which these objectives will be achieved.	-to empower the youth of all nations to become catalysts for change through ICT. Cyber-Peace aims to promote the "Peace Culture" which is defined by the United Nations as "a set of values, attitudes, modes of behavior and ways of life that reject violence and prevent conflicts by tackling their root causes -capitalizing on the creative spirit of the youth to innnovate
12	Community Empowerment through the Use of Information and Communication Technologies	**Uganda National Council for Science and Technology**	Uganda 1998	The project team will conduct a feasibility study to determine suitable sites for "telecentres"; design the telecentres, and acquire and install equipment; and operationalize the telecentres by training operators and end-users, developing appropriate content and creating mechanisms of financing	local capacity to use ICTs; knowledge regarding the key to the successful implementation of telecentres; enhanced awareness of the potential of ICTs in rural community development.
13	MILLION BOOK PROJECT AND BA'S DIGITAL ASSETS REPOSITORY (DAR)	Bibliotheca Alexandrina 2. Carnegie Mellon University 3. Internet Archive, San Francisco 3. Over twenty international universities and information and development institutions from the USA, China and Indi	Egypt 2006	digitizing one million books within three years and publishing them as a searchable collection on the internet.	-In application, ICTs in creating access to information and knowledge -The role of governments and all stakeholders in the promotion of ICTs for development
14	IBRAHIM SHIHATA ARABIC UNIVERSAL NETWORKING LANGUAGE CENTER (ISAUC)	Bibliotheca Alexandrina (Ibrahim Shihata Arabic-UNL Center) 2. UNDL Foundation	Egypt 2005	Established a platform/system with multilingual automatic translation capacity	to enable all people to generate information and have access to cultural knowledge in their native languages.
15	DIGITIZATION OF	International School	Egypt 2006	integrated digital library, designed to	-ICT for Knowledge sharing across

	DESCRIPTION DE L'ÉGYPTE	of Information Science (ISIS), Bibliotheca Alexandrina 2. l\'Institut d\'Egypte 3. UNESCO		include collections from all over the world related to the modern history of Egypt	cultures
16	ENSTINET	The Egyptian National Scientific and Technical Information Network (ENSTINET)	Egypt 2004	-developing and maintaining local databases -Providing Egyptian research Community with a full 24/7 online as well as onsite access to global information resources via the INTERNET	to assist Egyptian problem solvers and decision makers to access and apply quality data and relevant, current information to development activities.
17	International Computer Driving License (ICDL)	Ministry of state for administrative development (MSAD)	Egypt 2010	-promoting e-literacy among government employees	To build staff capacity for enabling of modernization of the administrative body
	e-governance strategy in developing countries	Nigeria - The International Computer Foundation	Egypt 2007	The e-governance strategy is a project to help developing countries develop local content "intranet" solution for various government ministries and agencies	To build capacity for local content
18	CMMI guide/ Software Process Improvement (SPI)	**INDUSTRIAL MODERNISATIO N CENTRE**	Egypt 2007	?	Building the capacity of local IT SMEs to be able to participate in exporting products and services and become reliable partners while cooperating with international offshore enterprises
19	ICTs for Micro, Small and Medium Enterprise Development in Egypt	Egyptian Ministry of Information and Communication Technologies (ICTs)	Egypt 2006	Unspecified 'series of actions' by the Egypt's MoICTs	to help SMMEs appropriate ICTs and to use them wisely in ways that meet their needs.
20	WBDC / Microsoft Training	The Women's Business Development Center (WBDC) of the National Council for Women	Egypt 2008	-cooperation with Microsoft Egypt for training of women	-to train women entrepreneurs and their women employees, as well as training on the operation of small and micro enterprises with scientific tools to increase efficiency and productivity

21	The e-Learning Competence Centre "eLCC"	MCIT in cooperation with Cisco	Egypt 2007	-setting up of an organization to lead efforts to enhance workforce performance and human resources development as per government and business communities needs	To upgrade the local corporate culture and support the private sector driven economy. It
22	The Local Government Development Project	Government?	Egypt 2007	-establish backend systems, -unify services work cycles -training of employees on using IT -develop work methods in an enhanced work environment	to provide convenient, accurate, fast and efficient government services to governorates residents and achieve an integration of different government services; to simplify procedures, establish backend systems, and unify services work cycles in order to reach transparency and regulatory climate
23	Community Development Portal	Egypt Information and Communication Technology Trust Fund	Egypt 2007	The Community Development Portal (CDP) aka Kenana Online offers several online services; such as syndicated news, currency prices, a website directory, job search, and a multilingual dictionary. In addition there are development-oriented articles, categorized by subject under the Kenana Library section -involvement of CDP users in creating content, either that handling their own localities (remote ones in particular), developmental experiences (in case of civil associations), personal experiences (of self-made learning and work in private SMEs) or online interests	archive of content pertinent to human development written by experts in a simplified manner and based on authoritative sources, such as self-improvement skills, vocational guidance, healthcare empowerment, SMEs and NGOs. - user manage their own content via user-friendly content management tools.
24	National ICT Research and Development Centers of Excellence	Egypt - Ministry of Communications and Information Technology	Egypt 2008	-implement a network of experts who will overlook the different research directions. They will generate and exchange ideas, critically analyze existing and proposed projects. They will bring together a consortium, including members of the industry, Egyptian researchers, and international experts with a special focus on	to enable researchers to collaborate across disciplines on long-term projects that are locally relevant and internationally competitive

				those of Egyptian origin	
25	Information and Communication Technology Assisted Development (ICTAD)	DED Deutscher Entwicklungsdienst on behalf of Federal Ministry for Economic Cooperation and Development (BMZ)	Ethiopia 2010	-Embarked on a major national ICT capacity building program -1. Creating an enabling policy, regulatory and legal environment for the growth of ICTs; and establishing locally adapted ICT industry standards; 2. Developing the necessary ICT human resources, infrastructure, rural access, and diversified content; 3. Establishing a national ICT policy, advocacy and coordination body to facilitating the mainstreaming of ICTs for socio-economic development; 4. Facilitating the use of appropriate technologies for the development of applications and contents in various sectors for rural development, good governance, and service delivery in priority sectors.	-to utilize ICTs as an enabler in the country's development efforts -to exploit ICTs as an accelerator for the attainment of national development objectives.
26	Incorporating Gender into the ACACIA National Strategy for Sénégal	**International Development Research Centre**	Senegal 1997	-involve adopting an ICT action plan for women, identification of women's needs, and implementation of information/awareness campaign for women	Providing women and young people with access to ICTs, - focusing on the use of ICTs as a tool for women's liberation
27	Defining Local Content and Appropriate Information Tools for Rural Development (Ghana)	**Ghana Information Network for Knowledge Sharing**	Ghana 2005	Used action-research in developing local content in a participatory manner, intended to disseminate it using tools such as the Internet, CD-ROM, cellular telephone, digital video and voice playback	-to enhance information and knowledge sharing between underprivileged communities in Ghana
28	United Nations Health InterNetwork	WHO (World Health Organisation)	International 2004	Implement a Health InterNetwork for providing access to high quality .. info via internet	- to bridge the digital divide in health by providing access to high quality, timely information for health professionals, researchers and policy makers in developing countries
29	Connect a School, Connect a Community	International Telecommunication Union	International 2010	Connecting schools and using them as access points for disadvantaged and vulnerable communities	-to provide connectivity and access to services for persons living in rural, marginal urban and isolated areas, with a

					particular focus on disadvantaged and vulnerable groups such as women and girls, indigenous people, persons with disabilities and youth and children
30	Capacity Building for ICT Policymaking	UNECA (Economic Commission for Africa)	International (DCs) 2008	stress the link between the use of ICT and promotion of development, including the achievement of the MDG, in particular Goal 8 "Develop a global partnership for development"	to build sustainable national capacity in developing countries to build up and implement ICT policies and e-Strategies harnessing the potential of ICT for development
31	Strengthening the telecentres in Kenya for effective knowledge management and networking through capacity building	**Kenya Network of Telecentres in partnership with other stakeholders**	Kenya 2012	Providing support to the growth and sustainability of telecentres.	to support the growth and sustainability of telecentres. **Belief:** "Telecentres offer the critically needed shared access in rural areas of Africa".
32	New Regional Centre in Tunisia to Help Youth Participate in the Knowledge Economy	Microsoft Corporation & Tunisian Ministry of Youth	Tunisia 2006	inaugurated the InfoYouth Centre, a regional community technology centre for North Africa.	-designed to provide youth with access to, and skills training in, the information technologies (IT).
33	'One Dollar for Development' ODFD	FORMIT Foundation	LDCs 2010	-availing e-government application in use in the north to governments in the south at no cost.	To contribute to development through technology transfer from developed to developing countries -promote ICT applications benefits in all aspects of life: e-government applications
34	East Africa E-Government Academy	Kenya - Jomo Kenyatta University of Agriculture & Technology (JKUAT)	Kenya 2006	Offering training to government officials	to deliver tailor made E-Government Training targeted at Governments endeavouring to deliver services to its citizens electronically.
35	ICTs for Equal Access to Human Resources in Health in Francophone	**Reseau Informatique Malien d'Information et de**	Mali 2009	Researching for better understanding on how ICTs can facilitate equitable distribution of health personnel	to ensure equitable access to health services in developing countries is becoming more and more feasible

	Africa	**Communication Medicale**			
36	Public Access Strategies: Enhancing ICT Services in Telecentres (Mozambique)	**University Eduardo Mondlane**	Mozambique 2005	Expanding and extending telecentres and ICt services to reach the poorest communities possible, -identifying ICT services that best meet the needs of impoverished communities at low cost	to help communities utilize new communications services to their own benefit
37	International Trade and Sustainable Development: Accessing Information on WTO, NEPAD, ACP–EU Agreements for Civil Society Organizations in Nigeria.	Development Information Network	Nigeria 2005	-articulating inputs into the Nigerian, Regional and Global Trade Agenda.	-to facilitate trade and sustainable development
38	Capacity Building in Open Medical Record System (OpenMRS) in Rwanda	**Partners in Health (PIH)**	Rwanda 2011	Rolled out OpenMRS nationally to track patient-level medical information for improved healthcare delivery	to collect health information more effectively and allocate resources more efficiently, thereby improving health service delivery
39	it@ab - the Southern African Network on "Information Technology in African Business"	**InWent Internationale Weiterbildung und Entwicklung gGmbH on behalf of Federal Ministry for Economic Cooperation and Development (BMZ)**	SADC – (Angola, Malawi, Mozambique, Namibia, Tanzania, South Africa, Zambia) 2009	- provides specific training programs to secure a broad know-how basis for ICT on local, regional and international levels -works in a broad based partnership with business agencies, universities and ISPs	To promote local business development as well as regional business cooperation
40	Popular organizations	**Environmental**	Senegal	-created community resource centres in the	To enhance popular organizations in

	and ICTs: economic footing - Phase II	**Development Action in the Third World**	2004	vulnerable communities of Dakar, Senegal	providing basic services accessible to the poorest at low cost, in fighting poverty
41	Training Program for Volunteers in Community Multimedia Centres (Sénégal)	UNESCO	Senegal 2007	Established community multimedia centres (CMC) which combined radio and access to ICTs under one roof.	to reduce the Digital Divide, to facilitate access and appropriation of information and communication technology (ICT), and to reduce poverty by building communities' capacity to resolve the problems that face them
42	Integration of ICTs in Local Government in Senegal	**International Development Research Centre** The project is a joint initiative of Alcatel, IDRC and UNCDF (United Nations Capital Development Fund)	Senegal 2006	integrating ICT applications and services within the process of decentralization and local governance in Sénégal.	to stimulate economic and social development in African communities
43	ICTs and the Employment of People with Disabilities	**International Development Research Centre**	Senegal 2001	Developed a gateway website on the training and employment of disabled	-to combat the workforce exclusion experienced by the disabled, and to promote their insertion into social life and the labour market
44	Research ICT Africa - Phase II	**University of the Witwatersrand**	South Africa 2008	Strengthened a policy research base in order to allow governments to make informed decisions on ICTs	To widen the diffusion of ICTs and the reduction of Digital Divide
45	Computer Recycling	**International Development Research Centre** - The Universal Services Agency of	South Africa 1998	established an infrastructure to collect, refurbish and deploy computers in South African school and telecentres	To extend connectivity and access to ICTs to rural communities

		SA			
46	e-Government and rural connectivity	**Centre for e-Innovation**	Western Cape Province of South 2009	-deploys infrastructure for e-government as well as rural connectivity -provides free connectivity	To build capacity in rural areas for e-learning and access to government services
47	Application of ICTs in the HIV/AIDS Response in Eastern and Southern Africa	**AFRIAFYA**	Botswana, Kenya, South Africa, Tanzania and Uganda 2004	Addressing the challenges of HIV/AIDS through ICTs -ICTs used to increase access to HIV/AIDS treatment, care and prevention -ICTs used to mitigate the effects of HIV/AIDS in communities -appropriate policies used	Community gain welfare – needs approach
48	Strengthening the Productive Capacity of Youth and Women Returnees	**Canadian Physicians for Aid & Relief**	Uganda 2005	-integrating ICTs into existing economic activities, and applying them to vocational skills training; counselling, mental health and trauma healing; income generating activities (credit, agriculture, business), improving business and marketing opportunities and skills.	to enhance the reintegration and improve the livelihoods of young people and women whose lives were devastated by civil war in Uganda
49	Economic Empowerment of Women through ICTs in Uganda	**Council for the Economic Empowerment for Women in Africa**	Uganda 1999	-established an information and communication technology (ICT) infrastructure, in the form of 'Women's Information Resource and Electronic Service (WIRES)', in Kampala, connected it to two rural sites, Nabweru and Buwama	To improve SMEs' access to information on resources, markets and support services
50	Community Empowerment through the Use of Information and Communication Technologies	**Uganda National Council for Science and Technology**	Uganda 1998	Construct, install equipment and operationalize telecentres	to accelerate community development via telecentres.

51	Establishment of a National Network of Community Multi-media Centres	**Uganda National Commission for UNESCO**	Uganda 2002	Implemented Community Multimedia Centre (CMC), a model that combines two models: Multipurpose community telecentres and FM radio broadcast	To allow disadvantaged communities engage and benefit from the exchange of information. The CMC helps them to overcome the barriers of language and illiteracy
52	Contribution of ICTs to the Rejection of Female Genital Mutilation in Francophone West Africa	**Environmental Development Action in the Third World**	Burkina Faso, Mali and Senegal 2006	Use ICTS to campaign against FGM	Change of behaviour against female genital mutilation

Appendix C: ATLAS.ti Code Manager Output : Codes Concepts Grounded in Data

Family Population	Code Name	No. of Projects in which it appears	Inter-Family linkages (host family and others)	Families to which the Code relate
Access and Ubiquity focus Access to content based development perception Access to ICTs based development perception Economic development linked project ideas Promoting socially embedded social innovation Focus on promoting socially embedded capacity for innovation Focused on creating capacity to use ICTs Project ideas linked to social development Technocentric project ideas	Access to content/knowledge	6	0	Access to content based development; Theoretically perceived against grounded linkages of technology; innovation and social development; social development
	Addressing social needs	0	0	Theoretically perceived against grounded linkages of technology, innovation and social development
	Bridging digital divide	5	1	Embedded SI
	Broad front approach	3	1	
	Connectivity	8	1	Access and ubiquity focus; Technological intervention innovation
	Cost hindrance to ubiquity	2	0	
	Creativity-pro policy focus	1	0	Embedded SI
	Economic development	0	0	Theoretically perceived against grounded linkages of technology, innovation and social development
	Government initiatives	2	0	
	Human-centric focus	2	0	Embedded SI
	Human resource capital for ICTs	3	0	
	ICTs access and use	6	0	Access to ICTs based development; Focused on creating use capacity; Theoretically perceived against grounded linkages of technology; Innovation and social development

Family Population	Code Name	No. of Projects in which it appears	Inter-Family linkages (host family and others)	Families to which the Code relate
	ICT infrastructure focus - technocentricity	8	1	Technological intervention innovation
	ICT to support indigenous knowledge	3	0	
	Institutional capacity focus	0	0	Embedded SI
	Internal/local capacity for ICTs	1	0	Focused on socially embedded capacity for innovation
	Internet for development perception	5	0	Theoretically perceived against grounded linkages of technology, innovation and social development
	Linking ICTs to economic development	8	0	
	Policy dimension	2	0	Embedded SI
	Promoting local creativity	0	0	Embedded SI
	Promoting participated innovation	1	0	Embedded SI; Focus on socially embedded capacity for innovation; Social development;
	Promoting PPP	3	0	
	Safety measures in ICTs	1	0	
	Social development oriented	3	1	

Family Population	Code Name	No. of Projects in which it appears	Inter-Family linkages (host family and others)	Families to which the Code relate
	Social oriented impact focus	5	1	Economic development; Focus on socially embedded capacity for innovation; social development
	To ensure equitable access to services	3	0	
	To provide access to ICTs	5	0	Access and ubiquity focus; Technological innovation intervention
	Top-down empowerment	8	0	
	To arouse user awareness	2	0	Focused on creating capacity for use
	Sensitization for use of ICTs	4	0	Focused on creating capacity for use

Appendix D: Empirical Thematic Identification and Distribution

Theme	Project reference number in the analysis table where it features (Appendix B: Analysis of ICT Projects in Africa	Number of projects in which it features
Provide ICT Infrastructure for access and connectivity to marginalized communities	1,4,5,	3
Training for ICTs use capacity building	5,7	2
Building capacity for policy research	6,	1
Linking ICTs to local conditions – small scale agriculture which employs more than 60% of the workforce in Africa.	9	1
Telecentres offer the critically needed shared access in rural areas of Africa	12, 19, 50, 51, 31, 41	6
The mobile internet access model for exposing rural communities to internet access point (following users /or taking technology to users).	10	1
The use of ICTs Applications in addressing social needs: health care,	23, 2,	2

Theme	**Project reference number in the analysis table where it features (**Appendix B: Analysis of ICT Projects in Africa	**Number of projects in which it features**
environment, (education not vividly targeted)		
ICTs to foster 'equitable distribution' of resources –(health care personnel) and resource allocation – (Technology for curbing un-equitable resource allocation)	35, 38	2
Government playing role to support the growth of the use of ICTs in the private sector	18,19,21	3
Promoting the spirit to innovate	11	1
Initiative for locally driven content management – demonstrated in Egypt (Local content factor)	13,14,15,16, 23, 27	6
Mainstreaming of ICTs for socio-economic development was a policy issue, spearheaded by government and country vision	25	1
ICTs for disadvantaged/marginalized groups – women, disabled	20,52, 26, 43	4
The harnessing of the potential of ICTs was linked to policy. Africa is short of policy intellectuality to support policy formulation in the area of ICT infrastructure and sector performance	44, 30	2
'modernization' of local communities, 'modernization of economic practices	8, 17	2
North-to-South 'technology transfer' to narrow the digital gap	33	1
Total		**38**

Appendix E: Construct Abstraction from the activity of WSIS and IDRC.

"As the presence and influence of information and communication technologies (ICTs) continues to widen and deepen, so too does its impact on economic development. However, much work needs to be done before the linkages between economic development and ICTs can be understood in a systematic and meaningful manner. …… (***focus expansion***) ….to expand the scope of conventional investigation beyond the telecommunications **industry to include other vertically integrated components of the ICT sector such as manufacturing and services**" (**IDRC Project Number 1051227 'Statistical Compilation of the ICT Sector and Policy Analysis'**)

"The **Internet is often seen to be both an enabler and an equalizer,** because it allows citizens a means to discuss their regions and businesses, to voice their concerns and to connect to the people they care about" **(IDRC P no.106228 'Who represents the Arab world online')**

"Access to basic services (water, sanitation, energy and communication) at affordable cost is essential to human development and health. Due to the nature of networked utilities - the fact that they are monopolies or oligopolies - the existence of an effective regulatory regime is crucial to ensuring that consumers have access to services and receive good quality service. The regulatory regimes in most developing countries have emerged and evolved with little or no input from their main beneficiaries. The recent rise of a wide range of collaborative information technologies (twitter, social networking sites, wikis, phone text messaging, etc.) could potentially offer consumers an opportunity to monitor such things as utilities' compliance with approved standards, efficiency, quality of service, use of public funds, cost structure, and other issues. This could rapidly lead to more efficient provision of services with increased access at lower prices." **(IDRC Project Number 106451 'Bidirectional Access Promotion Society Citizenship, Collaborative Technologies and Regulation'** Peru and El Salvador)

"The cost of access to information and communication technologies (ICTs) in Africa remains the major impediment to the participation of Africans in the networked society. While Africa is the region with the fastest growing number of mobile phone subscribers in the world, only a few African countries have gained access to such innovations for the poor as mobile money transfers and market information for marginalized farmers".(**IDRC P no. 106231 'Evidence based ICT policy for development and innovation')**

"….help African countries develop and maintain low-cost sustainable health information systems, and use the information systems to address health issues at both the facility and the public health level. ……. by reinforcing implementation of an open source medical record system (OpenMRS) in Mozambique, South Africa and Zimbabwe, and by supporting and expanding the OpenMRS developers network. The idea is to develop a framework for the integration of free and open source (FOSS) computerized health information, communication technologies……" **(IDRC Project Number 104508 'Open Architecture, Standards and Information Systems (OASIS) for Healthcare in Africa')**

"Developing countries' access to information and communication technology (ICT) is severely limited by the high cost of purchasing expensive software. Open source software is available free of charge and as such represents an opportunity for bridging the digital divide. Open source software also refers to applications and operating systems whose source codes are open for other parties to review, comment on, refine and make additions to. It also constitutes the most likely avenue for the creation of local language fonts and local content ("localization") in areas where software markets are too small for major software investment". **(IDRC Project Number 101223 'International Open Source Network' – Pan-Asia)**

"ICT solutions based on free and open source software (FOSS), …… for advancing their development in

administration, education, health, or business promotion. The free availability of the source code and the liberal licensing of FOSS allow to study, change, and improve the software. Therefore, FOSS enables developers to build on existing software solutions, to adapt software to local needs, and to legally realize cost-efficient local IT systems. While in several regions of the world, vibrant communities of FOSS developers continually enhance and increase the available software pool, many (***IT experts in developing countries?***) lack FOSS knowledge and are not well networked, neither among each other nor internationally. **In local government and educational institutions, knowledge about FOSS opportunities is not widespread among decision makers,** and many entrepreneurs are not aware of how to make a business out of FOSS. In this context, the (……..) to raise awareness, build and enhance capacities, and stimulate networking on FOSS issues at different levels of key stakeholders. ……..(*to*) effectively realize local innovative ICT solutions for development. Fostering (*and*) strengthening local human capacities and empowering people to develop their own solutions for social and economic development ……" (**WSIS stocktaking ID 1248943236 it@foss Promoting Free and Open Source Software in Southeast Asia**) Compare with the SL framework.

"IDRC's Acacia (Communities and the Information Society in Africa) program initiative is an international effort to empower sub-Saharan African communities with the ability to apply information and communication technologies (ICTs) to their own social and economic development". (**IDRC 'Mozambique Acacia Advisory Committee Secretariat')**

" ….. the extent to which universities encourage innovations that enhance the economic inclusion of populations engaged in informal sector jobs. By identifying new ways to involve a wider range of social actors, universities can help to connect knowledge, capital, and other assets that have traditionally supported innovation in areas such as the informal economy. Too often, universities have focused on research and development, the commercialization of products, and industry interactions, especially in the high tech sector. This approach often ignores the concept of inclusive development". **(IDRC Project Number 106652 'Universities in Innovation for Inclusive Development: Africa'**)

Microsoft- "We believe that through innovative public-private partnerships tailored to meet a communitys' needs, both targets are achievable and worthy endeavours". …… Microsoft's efforts to "advance digital inclusion revolve around a comprehensive, long-term investment to provide ICT access, education, and skills training that enable people to embrace new opportunities and play a role in today s knowledge economy". **(WSIS stocktaking Project ID: 1142000974 Microsoft commits to extend ICT capacity building efforts to 250 million people over five years**)

"The need for Zambia's population to have access to affordable ICT services and products is being echoed by the government and the international community through the United Nations to improve economies of developing countries. **Existing situation as regards to ICT access and services in Zambia is by far inadequate particularly in rural areas as evidenced by current statistics.** The youth and women are more affected. The Transitional National Development Plan and the Poverty Reduction Strategy paper identifies among other **national priorities provision of increased ICT infrastructure and services. It is outlined in the national ICT policy that investment in social and economic infrastructure such as telecommunications, roads, and electricity and community access points is key** to successful implementation of the National ICT policy" (**WSIS stocktaking P ID 1129792495 'ICT Advocacy and use among the Less privileged communities in Zambia'**)

Resources The ICT Development Fund, established by the UAE Telecommunications Regulatory Authority (TRA), is the first of its kind in the Middle East. The target goals of the Fund are to develop the ICT industry, foster R&D, encourage capacity building, and enhance education and training in the field of ICT. Moreover, this initiative will sponsor and organize ICT-related events and partner with leading international R&D institutions. The Fund will be financed by payments from the primary licensed

operators in the amount of 1% of their revenues. Other sources of income may include government and/or private grants, returns from ICT Fund investments, potential income from patents and other intellectual property derived from ICT Fund projects, in addition to any other sources approved by the TRA. (**WSIS Stocktaking ICT Development Fund: Project no 1269256234 Entity: United Arab Emirates - Telecommunications Regulatory Authority**)

"There is growing awareness throughout the world that innovation is the main driver and critical source of sustainable economic and social wellbeing. The government of the Philippines recently announced a national innovation strategy called Filipinnovation, which aims to achieve the following by 2010: a competitive and multidisciplinary workforce competent in producing value-added knowledge-based services; competitive local firms driven by innovation brought about by increased research and development (R&D), and a public policy environment that ensures continuous innovation". **(Toward an Innovation-led Development Path in the Philippines :Project Number 105177**)

"…… science, technology and innovation (STI) are critical elements in economic and social development. However**, the path from scientific research through technological innovation to development is not straightforward because of the complexity of the issues involved**. It would therefore be useful for different countries to share experiences and draw practical lessons from each other's successes and failures, while bearing in mind differences in specific situation". **(STI for Development in Asia : a Platform for Information Sharing and Learning Project Number 105179**)

"ICTs offer immense possibilities for reducing poverty, overcoming women's isolation, giving women a voice, improving governance and advancing gender equality", Najat Rochdi, Regional Coordinator, ICTDAR. ICTDAR capitalizes on ICT as a tool for promoting human rights of the vulnerable and for helping bridge the digital divide, which is a reflection of societal and gender divide. (Information and Communication Technologies for Development in Arab Region (ICTDAR: WSIS Project No 1142935351 **2007**)

"Acquisition of **technological capabilities, and the creation of an innovative environment in Africa** are crucial for competing in the global economy and industrialization. Since the 1980s, the social and economic context for development in the region has been changing through the implementation of a number of policies. ……. examine whether the new and emerging environment is conducive for innovation and the acquisition of technological capabilities, which are essential for surviving global competition and industrialization." **IDRC Project Number 1**055223 **Technological Capabilities in Sub-Saharan Africa in the Context of a Changing (Economic and Other) Policy Environment**

"How can science, technology, and innovation contribute to poverty reduction and inclusive development, especially in Brazil, Russia, India, China, and South Africa, otherwise known as the BRICS countries? Earlier IDRC-supported research analyzed and compared the diverse paths and development strategies of BRICS countries from the point of view of national innovation systems. A key finding is that **the benefits of innovations rarely address the needs of the poor because most policies and systems that support science, technology, and innovation target economic growth and competitiveness, not reducing poverty or inequalities**". **('Research on Innovation Systems and Social Inclusion in Emerging Economies and Beyond: RISSI at BRICS+ (Brazil, Russia, India, China, and South Africa' Project Number 106653**)

"universities can help **to connect knowledge, capital, and other assets that have traditionally supported innovation in areas such as the informal economy**. Too often, universities have focused on research and development, the commercialization of products, and industry interactions, especially in the high tech sector. This approach often ignores the concept of inclusive development". (**Universities in Innovation for Inclusive Development: Africa Project Number 106652S Group SI | IID**)

“The free availability of the source code and the liberal licensing of FOSS allow to study, change, and improve the software. Therefore, FOSS enables developers to build on existing software solutions, to adapt software to local needs, and to legally realize cost-efficient local IT systems”. **(WSIS Project ID1248943236 it@foss Promoting Free and Open Source Software in Southeast Asia**)

“Grassroots innovations are innovations that emerge from local traditional and informal knowledge systems, with or without blending with formal knowledge. Grassroots innovation has yet to be fully understood or exploited ……. “examine the external environment in which an innovation serves a public good, finds a market, gets scaled up or otherwise finds expression as a socially and economically valued product. …….. the premise is that national innovation systems can only benefit the poor and other excluded sections of society when they do not rely entirely on formal science and technology systems. …… (*the global community of practice needs to*) recognize that new ways and institutional arrangements for reducing poverty in the rural hinterland are urgently needed, *(in the realm of*) espoused national policies that seek to balance rapid economic growth with social equity. (**Grassroots Innovation in China and India Project Number 105170 IDRC**)

“Based on the results of previous research (003728/97-8908 and 004227/98-8904), it is apparent that the provision of telecentres and information and communication technologies (ICTs) is not enough to ensure the adoption of these services by individuals and communities. Further effort is required to help communities utilize new communications services to their own benefit. This (……) examines the application of ICTs in telecentres and investigate expanding and extending them in such a way that even the poorest communities can benefit.”. (**IDRC P no 101560 ‘Public Access Strategies: Enhancing ICT Services in Telecentres (Mozambique)’**)

“The rapid expansion of telecommunications infrastructure in recent years has done much to bridge the digital divide. However, cost remains the principal obstacle to connectivity in Africa. The concept of "last mile" as applied to telecommunications infrastructure is traditionally defined as that which is required to connect a person or institution to the local telephone company, a problem traditionally solved by the telephone company. The concept of "first mile" mentioned in the title represents a more bottom-up analysis of the problem: it refers to new and inexpensive technologies (wireless, open source telephony applications) that are potential solutions to the problem. "First inch," on the other hand, addresses **the fact that it is often not enough to place technology in the hands of the user**. Rather, **technology must be adapted to the local environment by taking into account such factors as language, literacy, physical access, etc**. This grant will support 10 innovative pilot projects in rural and periurban areas in Southern Africa. Researchers will carry out a comparative analysis of the various technologies involved and **map behavioral changes related to the introduction of these technologies**.” **(IDRC Project Number 1076400 2008 ‘Comparative study of "first mile" and "first inch" technologies’)**

“In Africa, as elsewhere in the world, policymakers are under pressure to reform their laws, policies and practices with a view to participating fully in the knowledge economy. The challenge is to find the right balance between policies that support openness and the dissemination of information, on the one hand, and those that address national security, national interests and law enforcement, on the other. This grant will support an exploration of the linkages between information and communication technology (ICT), governance and human rights in five African countries with various ICT environments and legal regimes, such as common law, civil law and Roman Dutch law…”
(IDRC Project Number 105271 ‘Examining the Nexus between ICTs and Human Rights in Africa’)

Appendix F: WSIS Action Lines

Caption	Reference Name
C1	The role of public governance authorities and all stakeholders in the promotion of ICTs for development
C2	Information and communication infrastructure
C3	Access to information and knowledge
C4	Capacity building
C5	Building confidence and security in the use of ICTs
C6	Enabling environment
C7	ICT Applications
C8	Cultural diversity and identity, linguistic diversity and local content
C9	Media
C10	Ethical dimensions of the Information Society
C11	International and regional cooperation

Source: WSIS Document No. WSIS-03/GENEVA/DOC/5-E